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Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

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Includes administration and management; space law and related legal matters; legislative hearings and documents; and symposia or conferences of a broad or general nature.

N64-10669 Joint Publications Research Service, Washington, D.C.
WORKS ON HEAT-RESISTING MATERIALS, USSR
4 Feb. 1963 147 p Transl. into ENGLISH from Works of the Seminar on Heat-Resisting Materials 13–17 Jun. 1958, Byul. Inst. Metallokeramiki i spets. splavov, No. 5, Acad. of Sci. (Kiev), 1960 p 1–65 refs
(JPRS-17446; OTS-63-21045) OTS: $2.75

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N64-10702 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM IZVESTIYA AKADEMII NAUK SSSR [NEWS OF THE ACADEMY OF SCIENCES USSR] [MOSCOW] NO. 6, 1962
12 Feb. 1963 43 p refs Transl. into ENGLISH of two articles p 869–884; 896–908
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1. SOME HUMAN PHYSIOLOGICAL REACTIONS UNDER CONDITIONS OF ALTERNATING OVERLOADS AND WEIGHTLESSNESS I. I. Kas'yan p 24–40 refs (See N64-10703 02-14)

N64-10760 Joint Publications Research Service, Washington, D.C.
SOVIET GEOPHYSICAL AND METEOROLOGICAL RESEARCH IN 1962
28 Mar. 1963 40 p refs Transl. into ENGLISH of three articles from Izv. Akad. Nauk SSR, Ser. Geofiz. (Moscow), no. 1, Jan. 1963 p 147–151; 169–176; 177–182
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N64-10772 Joint Publications Research Service, Washington, D.C.
CYBERNETICS APPLIED TO TEACHING RESEARCH
Alfred Dietz 4 Apr. 1963 11 p Transl. into ENGLISH from Paedagogik (E. Berlin), no. 1, Jan. 1963 p 114–120
(JPRS-18549; OTS-63-21503) OTS: $0.50

The paper states that in research on teaching, it is necessary to apply the theory of multidimensional distribution of probability, because only then can the dialectical relation of the structure of teaching processes be comprehended with sufficient accuracy, from the scientific approach. P.V.E.

N64-10773 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM STIINTA SI TECHNICA (SCIENCE AND TECHNOLOGY) [BUCHAREST] VOL. 14, [no. 9 and no. 11] SEP.–NOV. 1962. (AIR TRANSPORT AND SPACE SCIENCE)

4 Apr. 1963 30 p refs Transl. into ENGLISH of four articles p 9–10; 8–9; 14–16; 24–25, 45
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N64-10778 Joint Publications Research Service, Washington, D.C.
CYBERNETICS – WHAT DOES IT REALY MEAN?
Peter Starke et al 5 Apr. 1963 9 p Transl. into ENGLISH from Leipziger Volkszeitung (E. Germany), 2 Feb. 1963 p 8
(JPRS-18569; OTS-63-21515) OTS: $0.50

The following topics are discussed: (1) cybernetic systems, (2) control and regulation, (3) algorithmic description, (4) automated repair, and (5) automation of phases of mental activity. R.T.K.

N64-10779 Joint Publications Research Service, Washington, D.C.
CYBERNETICS AND SCIENTIFIC-TECHNICAL PROGRESS
Karl-Heinz Kannegiesser (Inst. for Social Sci.) 5 Apr. 1963 8 p Transl. into ENGLISH from Arbeit (E. Berlin), no. 2, Feb. 1963 p 13–15
(JPRS-18570; OTS-63-21516) OTS: $0.50

The similarities between machines and the nervous processes of the higher organisms are outlined. The importance of cybernetics in the social sciences and in planning of the economy of a country, in particular, is stressed. A discussion is presented of methods for mathematical representation of economic problems, and the automation of routine administrative work. Cybernetic methods are inseparable from mathematical methods, and are necessary aids in analyzing complicated social processes. R.T.K.

N64-10795 Joint Publications Research Service, Washington, D.C.
STUDIES IN BIOPHYSICS
23 Apr. 1963 40 p Transl. into ENGLISH of three articles from Priroda (Moscow), no. 1, Jan. 1963 p 3–15; 54–60; 100–101
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N64-10800 Cornell U., New York, N.Y. Daniel and Florence Guggenheim Aviation Safety Center
SURVEY OF RESEARCH PROJECTS IN THE FIELD OF AVIATION SAFETY 1963 Annual Supplement
Ruland M. Woodham [20 June 1963] 90 p refs

Research projects are cited in the areas of accident prevention and protection, air transportation, aircraft instruments, airplane design, airports and airways, aviation medicine, electronics, equipment and materials, meteorology, navigation, operating problems, and powerplants. J.E.T.

N64-10822 Joint Publications Research Service, Washington, D.C.
APPLICATION OF TEACHING MACHINES IN EDUCATION
Ye. A. Sankovskiy (Minsk Coll. of Radio Engr.) 6 Nov. 1963 7 p Transl. into ENGLISH from Vysshey, Shkoly (USSR), no. 3, 1963 p 18–20
(JPRS-19506; OTS-63-21964) OTS: $0.50

The three types of teaching machines described are designed for: (1) self-examination, (2) testing, and (3) counseling. The machines are assembled with the use of semiconductor components and relays. The three machines differ from one another in circuitry, operation, layout, the quantity of programs that can be handled, and the number of questions in these programs. Machine programs have been developed for teaching nine specialized engineering disciplines and foreign languages. R.T.K.

N64-10838 Joint Publications Research Service, Washington, D.C.
ACCURACY PROBLEMS IN THE OBSERVATION OF ARTIFICIAL EARTH SATELLITES
M. J. Illenko (Acad. Sci. USSR) et al 11 Jul. 1963 9 p refs Transl. into ENGLISH from Byul. St. Optich, Nablyudeniya Iskusstv. Sputnikov Zemli (USSR), no. 25, 1962 p 5–6 and 13–15
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N64-10844 Joint Publications Research Service, Washington, D.C.
SOVIET SCIENTIFIC ACTIVITIES AND PERSONALITIES
20 Aug. 1963 62 p refs Transl. into ENGLISH of 11 articles from Atomnaya Energ. (Moscow), and Izy. Sibirsk. Otd. Akad. Nauk SSSR (JPRS-20730; OTS-63-31581) OTS: $2.00

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N64-10853 Joint Publications Research Service, Washington, D.C.
INTERACTION OF FREE RADICALS
A. I. Agatova et al 21 Nov. 1963 14 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSR (Moscow), v. 150, no. 3 1963 p 547–550 and 588–591
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N64-10863 College of Aeronautics, Cranfield (Gt. Brit.)
TEACHING MACHINES FOR TEACHING WORK STUDY
H. C. Wiltshire May 1963 11 p refs
(CoA. Note 154)

Machines which have been used successfully for the teaching of work measurement practices are described. Although designed to shorten the period of instruction for beginners, they appear to be suitable for postgraduate students and also for management-consultant trainees. Author

N64-10868* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TELSTAR I, VOLUME I
Jun. 1963 400 p refs For vol. 2 see N64-10882 02-01; for vol. 3 see N64-11079 02-01
(NASA SP-32, Vol. 1)

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N64-10882* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TELSTAR I, VOLUME 2
Jun. 1963 525 p refs For vol. 1 see N64-10868 02-01; for vol. 3 see N64-11079 02-01
(NASA SP-32, Vol. 2)

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N64-10904* General Dynamics/Astronautics, San Diego, Calif.
PROCEEDINGS OF THE MERCURY-ATLAS BOOSTER RELIABILITY WORKSHOP [HELD AT] SAN DIEGO, CALIFORNIA, 12 JULY 1963
[1963] 331 p
(NASA CR-52665) OTS: $19.75 ph, $10.13 mf

Proceedings of the Mercury-Atlas booster reliability workshops are presented. The goal of these workshops was to communicate the experience gained on the Mercury-Atlas program so that it could be applied to future space programs. Workshop topics include: management review, human factors, supplier coordination, design controls, manufacturing and process controls, and test control. M.P.G.

N64-10911* RAND Corp., Santa Monica, Calif.
THE APPLICATION OF PASSIVE MICROWAVE TECHNOLOGY TO SATELLITE METEOROLOGY: A SYMPOSIUM
Yale H. Katz, ed. Aug. 1963 265 p refs Proc. of a Symp. held at Santa Monica, 30 Jul.–1 Aug. 1962
(NASA Contract NASr-21(07))
(NASA CR-52130; RM-3401-NASA) OTS: $17.00 ph, $8.15 mf

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B. ATMOSPHERIC RADIATIVE TEMPERATURE MEASUREMENT R. A. Smith (G.E. Co.) p 37–49 refs (See N64-10913 02-12)

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D. A MILLIMETER-WAVE RESEARCH PROGRAM IN CLOUD PHYSICS L. Wijnberg (Cornell Aeron. Lab., Inc.) p 213–217 (See N64-10928 02-21)

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APPENDIX: METEOROLOGICAL SATELLITES AND NUMERICAL WEATHER PREDICTION Y. Mintz (RAND Corp.) p 241–253 refs (See N64-10931 02-21)

N64-10927* Naval Ordnance Lab., Corona, Calif.
NAVAL ORDNANCE LABORATORY MEASUREMENTS PROGRAM
M. C. Hoover, Jr. *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 210–212 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

A proposed program for making radiometric measurements is discussed. Since the program is primarily for military application, the "targets" will be bridges, railroads, tanks, and trucks, in such different environments as heavy snow, desert sand, and the temperature of the Central-California coast. The air temperature, the target's initial thermal temperature, the humidity, the pressure, the sun angle (with relation to the target), and the cloud cover will be recorded. Typical Dicke radiometers at two frequencies—X band and Ka band—will be used. All measurements will serve as data to alter the radiometric temperatures. I.v.L.

N64-10937* National Aeronautics and Space Administration, Washington, D.C.

MEASUREMENT OF THERMAL RADIATION PROPERTIES OF SOLIDS

Joseph C. Richmond, ed. (Natl. Bur. of Standards) 1963 596 p refs Proc. of a Symp. held at Dayton, Ohio, 5–7 Sep. 1962 (Sponsored jointly by USAF-ASD, NBS, and NASA) (NASA SP-31) GPO: $3.50

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12. PORTABLE INTEGRATING SPHERE FOR MONITORING REFLECTANCE OF SPACECRAFT COATINGS W.B. Fussell, J. J. Triolo, and F. A. Jerozal (NASA, Goddard Space Flight Center) p 103–116 refs (See N62-17073 18-15)

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N64-10976* National Aeronautics and Space Administration, Washington, D.C.

ROLE OF HIGHER EDUCATION IN OUR NATION'S FUTURE News Release

James E. Webb 16 Nov. 1962 10 p Presented at the Tex. Agricultural and Mech. Coll., College Station Nov. 16, 1962 Available from NASA. Office of Scientific and Technical Information, Wash., D.C.

The role of higher education in the future of the United States was discussed. The concern and influence of businessmen, administrators, eminent educators, and institutions of higher education must be demonstrated in an effort of continuing progress. C.L.W.

N64-11001 Joint Publications Research Service, Washington, D.C.

ELECTROMAGNETIC WAVE SCATTERING AND SUPER-HIGH VACUUM VIA SEMICONDUCTORS

V. I. Mykhaylov et al 8 Feb. 1963 15 p refs Transl. into ENGLISH of two articles from Ukr. Fiz. Zh. (Kiev), v. 7, no. 12, Dec. 1962 p 1274–79 and 1367–68
(JPRS-17532; OTS-63-20180) OTS: $0.50

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2. OBTAINING SUPER-HIGH VACUUM BY MEANS OF OXIDE ELECTRONIC SEMICONDUCTORS PULVERIZED BY ELECTRON BOMBARDMENT G. S. Mykhaylov, O. M. Akymovych and I. B. Pronina p 9–12 refs (See N64-11003 02-23)

N64-11007 Joint Publications Research Service, Washington, D.C.
SOVIET RESEARCH IN POWDER METAL MATERIALS
28 Feb. 1963 29 p refs Transl. into ENGLISH of six articles from Metallokeram. Materialy i Metody ikh Issled., Akad. Nauk Ukr. SSR, Inform. Materialy (Kiev.) 1959 p 11–16; 25–26; 45; 50–55
(JPRS-17887; OTS-63-21231) OTS: $0.75

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4. PRODUCTION OF TITANIUM NITRIDE FROM SPONGE TITANIUM T. S. Verkhoglyadova p 14–15 ref (See N64-11011 02-19)
5. A NEW METHOD OF MANUFACTURING RODS MADE OF REFRACTORY COMPOUNDS V. V. Pen'kovskiy and G. V. Samsonov p 16–21 refs (See N64-11012 02-17)
6. PRODUCTION OF NITRIDES OF REFRACTORY METALS G. M. Samsonov, T. S. Verkhoglyadova, M. M. Antonova, and T. V. Dubovik p 22–26 refs (See N64-11013 02-17)

N64-11014 Joint Publications Research Service, Washington, D.C.
SOVIET EXPERIMENTS WITH TUNGSTEN, MOLYBDENUM AND ALLOYS OF REFRACTORY METALS
5 Mar. 1963 57 p refs Transl. into ENGLISH of articles from sources on Soviet powder metallurgy
(JPRS-17955; OTS-63-21251) OTS: $1.50

CONTENTS:
1. PROPERTIES OF TUNGSTEN-RHENIUM ALLOYS Ye. M. Savitskiy, M. A. Tylkina, S. I. Ipatova, and Ye. I. Pavlova p 1–12 refs (See N64-11015 02-18)
2. THE INFLUENCE OF CERTAIN OXIDES UPON THE RECRYSTALLIZATION OF MOLYBDENUM D. A. Prokoshkin and Shao-Tszyun p 13–18 refs (See N64-11016 02-18)
3. EXPERIMENTAL DETERMINATION OF THE ENTHALPY OF MOLYBDENUM AT TEMPERATURES OF 700–2337 DEGREES V. A. Kirillin, A. Ye. Sheyndlin, and V. Ya. Chekhovskoy p 21–27 refs (See N64-11017 02-18)
4. INVESTIGATION OF THE EFFECT OF TEMPERATURE ON THE MIGRATION OF ELEMENTS IN ALLOYS OF REFRACTORY METALS M. D. Smolin and I. N. Frantsevich p 28–33 refs (See N64-11018 02-18)
5. GROWING LARGE TUNGSTEN CRYSTALLITES BY RECRYSTALLIZATION DURING SINTERING OF TUNGSTEN SAMPLES O. V. Mitrofanov p 34–31 refs (See N64-11019 02-25)
6. THE USE OF TUNGSTEN IN POWDER IN THE PRODUCTION OF A POWDER WIRE FOR AUTOMATIC BUILD-UP N. A. Mal'tsev p 42–44 (See N64-11020 02-18)
7. LOW-TEMPERATURE SINTERING OF MOLYBDENUM A. V. Savin and Yu. A. Eyduk p 45–54 refs (See N64-11021 02-18)

N64-11029 Joint Publications Research Service, Washington, D.C.
PRINCIPLES OF THE DESIGN OF SELF-LEARNING SYSTEMS
21 Oct. 1963 187 p refs Transl. into ENGLISH of a collection of reports from "Printsipy Postroyeniya Samoobuchayushchiksya sistem" (Kiev), 1962
(JPRS-18181; OTS-63-21344) OTS: $3.00

CONTENTS:
1. ALGORITHM FOR TEACHING A MACHINE TO RECOGNIZE THE SIMPLEST GEOMETRICAL FIGURES V. M. Glushkov, V. A. Kovalevskiy, and V. I. Rybak p 5–25 refs (See N64-11030 02-20)
2. ALGORITHM FOR DISCERNING SENTENCE MEANING B. V. Glushkov, N. M. Grashchenko, and A. A. Stogniy p 26–36 (See N64-11031 02-20)
3. TEACHING THE RECOGNITION OF CONFIGURATIONS BY MEANS OF FORMAL INDICES V. I. Varshavskiy and T. N. Semyonova p 39–56 (See N64-10132 02-20)
4. MODELING OF NATURAL SELECTION IN A COMPUTER A. A. Letichevskiy and A. A. Dorodnitsyna p 57–65 (See N64-10133 02-20)
5. A PROBLEM OF DYNAMIC PROGRAMING Yu. Yu. Finkel'shteyn p 66–75 (See N64-10134 02-20)
6. SOME MATHEMATICAL PROBLEMS IN THE DESIGN OF A DIGITAL LOGICAL COMPUTER A. A. Stogniy p 76–92 refs (See N64-10135 02-20)
7. A GENERAL PURPOSE INSTALLATION FOR THE INVESTIGATION OF IMAGE RECOGNITION ALGORITHMS V. M. Glushkov, V. A. Kovalevskiy, V. I. Rybak p 93–109 refs (See N64-10136 02-20)
8. SOME CATEGORIES OF SELF-ADJUSTING SYSTEMS OF AUTOMATIC CONTROL A. I. Kukhtenko p 110–132 refs (See N64-10137 02-20)
9. INDUCTIVE AND DEDUCTIVE METHODS OF COGNITION AS A BASIS FOR BUILDING TWO PRINCIPAL TYPES OF LEARNING SYSTEMS A. G. Ivakhnenko p 133–155 refs (See N64-10138 02-20)
10. SELF-LEARNING AS ONE OF THE BASIC STEPS IN THE DESIGN OF SELF-ADJUSTING SYSTEMS P. I. Chinaev p 156–179 refs (See N64-10139 02-16)
11. SOME QUESTIONS ON THE TEACHING OF AUTOMATA A.A. Lyapunov p 180–185 (See N64-11040 02-16)

N64-11041 Joint Publications Research Service, Washington, D.C.
ARTICLES ON MEDICINE AND PHYSIOLOGY
25 Mar. 1963 25 p refs Transl. into ENGLISH of three articles from Fiziol. Zhur., Akad. Nauk Ukr. RSR (Kiev), v. 8, no. 6, Nov.–Dec. 1962 p 701–708; 815–817; 827–829
(JPRS-18339; OTS-63-21417) OTS: $0.75

CONTENTS:
1. THE ACADEMY OF SCIENCES UKRAINIAN SSR AND ITS ROLE IN THE FORMATION OF THE LEADING MEDICAL SCHOOLS O. F. Makarchenko and K. F. Duplenko p 1–12
2. AGE PECULIARITIES OF RADIOACTIVE PHOSPHORUS ASSIMILATION BY SKELETAL MUSCLES IN VARIOUS DEGREES OF FATIGUE O. V. Epshteyn p 13–17 refs
3. UTILIZING MULTICHANNEL ELECTRONIC POTENTIOMETERS FOR PHYSIOLOGICAL INVESTIGATIONS V. Ya. Berezovs'kiy and V. I. Mirutenko p 18–22 refs (See N64-11042 02-15)

N64-11073 Joint Publications Research Service, Washington, D.C.
ANNUAL MEETING OF THE ACADEMY OF SCIENCES USSR 4-5 FEBRUARY 1963
M. V. Keldysh et al 5 Jun. 1963 146 p Transl. into ENGLISH of a series of articles from Vestnik Akad. Nauk SSSR (Moscow) no. 3, 1963 p 3–76
(JPRS-19569) OTS: $2.75

The general meeting of the Academy of Sciences, U.S.S.R., was devoted to summarizing the results of its activity in 1962. Articles included in the translation are: (1) the introductory speech of the president of the Academy of Sciences U.S.S.R.; (2) the results of the scientific activity of the Academy of Sciences for 1962, as reported by the acting chief scientific secretary of the academy; (3) discussion of the summary report; (4) solution of organizational problems; and (5) the general meetings of the departments—physicomathematical, chemical, geological–geographical, biological, and technical sciences. R.T.K.

N64-11079* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TELSTAR I, VOLUME 3
Jun. 1963 283 p refs For vol. 1 see N64-10868 02-01; for vol. 2 see N64-10882 02-01
(NASA SP-32, Vol. 3)

CONTENTS:

1. COMPONENTS FOR THE TELSTAR PROJECT W. C. Hittinger p 1659–1664 refs (See N64-11080 02-32)
2. COMPONENT DESIGN, CONSTRUCTION AND EVALUATION FOR SATELLITES D. S. Peck and M. C. Wooley p 1665–1686 refs (See N64-11081 02-06)
3. NICKEL-CADMIUM CELLS FOR THE SPACECRAFT BATTERY D. C. Bomberger and L. F. Moose p 1687–1702 refs (See N64-11082 02-06)
4. THE SATELLITE TRAVELING-WAVE TUBE M. G. Bodmer, J. P. Laico, E. G. Olsen, and A. T. Ross p 1703–1748 refs (See N64-11083 02-09)
5. THE DESIGN AND CONSTRUCTION OF THE ELECTRONICS PACKAGE R. H. Shennum and E. J. Reid p 1749–1763 refs (See N64-11084 02-09)
6. THE SOLAR CELLS AND THEIR MOUNTING K. D. Smith, H. K. Gummel, J. D. Bode, D. B. Cuttriss, R. J. Nielsen, et al p 1765–1816 refs (See N64-11085 02-06)
7. THE SATELLITE FERRIMAGNETIC POWER LIMITER L. J. Varnerin, R. L. Comstock, W. A. Dean, and R. W. Kordos p 1817–1827 refs (See N64-11086 02-06)
8. THE GROUND STATION HIGH-POWER TRAVELING-WAVE TUBE R. J. Collier, G. D. Helm, J. P. Laico, and K. M. Striny p 1829–1861 refs (See N64-11087 02-09)
9. MASERS FOR THE TELSTAR SATELLITE COMMUNICATIONS EXPERIMENT W. J. Tabor and J. T. Sibilia p 1863–1886 refs (See N64-11088 02-09)
10. PARAMETRIC AMPLIFIER FOR SATELLITE COMMUNICATION GROUND STATION RECEIVER M. Uenohara, M. Chruney, K. M. Eisele, D. C. Hanson, and A. L. Stillwell p 1887–1908 refs (See N64-11089 02-09)

N64-11096 California U., Livermore. Lawrence Radiation Lab.
HAZARDS CONTROL QUARTERLY REPORT NO. 13, APRIL-JUNE 1963
R. L. Kathren et al [1963] 58 p refs
(Contract W-7405-eng-48)
(UCRL-7450) OTS: $1.25

The following articles are included: (1) Relative Activity from Radioiodines Following Fission of U^{235}, (2) High Expansion Foam Fire Control System for Glove Boxes, (3) Determination of Dilution of Vapors in Calibration Bottles by Infrared Analysis, (4) Modification of a Davis Halide Meter for Methyl Chloroform Measurement, (5) Arc Sensitivity of a 3.4-Meter Spectrograph for Some Common Elements in Water Residues, (6) Flooring for High-Explosive Handling Areas, (7) Radiological Hazards Survey of the Cockcroft-Walton Ion Accelerator, (8) Investigation of Floor Finishes, (9) Fire Detection Circuits, and (10) Nomographs for Airborne Radioactivity Sampling. R.T.K.

N64-11112* National Aeronautics and Space Administration, Washington, D.C.
INTRODUCTION MA-8 PRESS KIT News Release No. 62-201
24 Sep. 1962 23 p

The Mercury-Atlas 8 flight of Astronaut Walter M. Schirra, Jr., is programed for as many as six orbits, according to the National Aeronautics and Space Administration. A full nine-hour, six-orbit mission requires no major change in spacecraft systems. A six-orbit mission would be beneficial in regard to astronaut experience, overall operational training, and spacecraft systems development for the one-day mission to be performed later. The MA-8 flight plan calls for more "drifting" flight than did the plans for the two previous, manned, orbital Mercury flights. The plan also includes a flare-visibility experiment, further photographic experiments, and an experiment with heat-protection materials. P.V.E.

N64-11113* National Aeronautics and Space Administration, Washington, D.C.
ADMINISTRATION AND THE CONQUEST OF SPACE News Release
James E. Webb [1962] 12 p Presented at the Natl. Conf. of Am. Soc. for Public Admin., Detroit, 13 Apr. 1962

James E. Webb, administrator of the National Aeronautics and Space Administration, in a speech on "Administration and the Conquest of Space" discussed five characteristics which distinguish NASA's assignment. He stated that: (1) space research and exploration has multiple and interrelated objectives; (2) space research and exploration requires a wide variety of skills and a vast accumulation of facilities and equipment; (3) long lead times, coupled with a rapidly evolving technology, adds further complexities to the task of organization of human effort for space exploration; (4) a high order of reliability is an absolute necessity; and (5) space research and exploration must be carried on under the persistent and exacting scrutiny of the public, the Congress, and the scientific community. P.V.E.

N64-11139 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
HEAT POWER ENGINEERING (SELECTED ARTICLES)
G. E. Kalinin et al 25 Jan. 1963 36 p refs Transl. into ENGLISH from Teploenerg. (Moscow), v. 10, no. 5, 1962 p 35–38 and 65–72
(FTD-TT-62-1456/1+2+4; AD-295781)

CONTENTS:

1. APPLICATION OF THE THEORY OF SIMILARITY TO THE EXPERIMENTAL INVESTIGATION OF THE WORK REGIMES OF GAS TURBINES G. E. Kalinin p 1–9 refs (See N64-11140 02-06)
2. METHODS AND CERTAIN RESULTS OF THE MEASUREMENT OF THE CRITICAL LOAD DURING THE TRANSITION FROM FILM TO BUBBLE BOILING B. S. Petukhov and S. A. Kovalev p 10–24 ref (See N64-11141 02-13)

3. METHODS OF GENERALIZING EXPERIMENTAL DATA ON CONVECTIVE HEAT TRANSFER DURING THE MOVEMENT OF GAS IN THE INITIAL REGION OF A CONDUIT S. I. Kosterin, A. I. Leont'yev, and V. K. Fedorov p 25–33 refs (See N64-11142 02-13)

N64-11199* National Aeronautics and Space Administration, Washington, D.C.
SPACE: THE CHALLENGE AND THE PROMISE News Release
Robert C. Seamans, Jr., 19 Nov. 1963 14 p Presented to the Greater Albuquerque Chamber of Commerce, Albuquerque, New Mex.
Available from NASA. Office of Scientific and Technical Information, Wash., D.C.

The contributions to the space effort of the state of New Mexico are discussed. An estimation is given of the cost of testing rockets, spacecraft, and other equipment for manned spaceflight programs, as well as the present stage of development of the space program. R.T.K.

N64-11302 Air Force Systems Command, Bedford, Mass Electronic Systems Div.
TACTICAL DECISION MAKING: I. ACTION SELECTION AS A FUNCTION OF TRACK LOAD, THREAT COMPLEXITY, RELIABLE DATA PRESENTATION AND WEAPON UNCERTAINTY
Wyatt R. Fox and W. H. Vance, Jr. (AFCRL) Nov. 1961 150 p refs
(ESD-TDR-61-42; AFCRL-997; AD-404264)

Two groups of experimental commanders performed under several levels of target track load and threat complexity conditions. The task of the commanders was: (1) to minimize damage to the weapon areas, (2) to destroy a maximum number of threatening vehicles, (3) to conserve counter weapons so as to consume a minimum of forces consistent with objectives (1) and (2), and (4) to develop his own strategy under constraints imposed by the ground rules. In order to provide some standard performance criteria, a sample of the experimental problems was solved analytically so as to represent both good and poor automated decision making, and idealized or maximum human performance. Human empirical scores compared favorably with analytical performance measures. Human empirical performance continuously improved as a function of number of system runs. Author

N64-11345 Hanford Atomic Products Operation, Richland, Wash.
HANFORD RADIOLOGICAL SCIENCES RESEARCH AND DEVELOPMENT ANNUAL REPORT FOR 1962
C. C. Gamertsfelder and J. K. Green, eds. Jan. 1963 320 p refs
(Contract AT(45-1)-1350)
(HW-77609) OTS: $4.00

A summary of research and development activities for 1962 is reported including: (1) atmospheric physics; (2) radiological physics; (3) radiological chemistry, including reactor studies, environmental studies, and radiation chemistry; (4) chemical effluents technology, including soil chemistry and geochemistry, soil physics, geology, radioisotopes as particles and volatiles, and uranium oxidation and fission product volatility; and (5) instrumentation, including automatic monitoring and recording methods, general radiological monitoring and circuit development, dosimetry instrumentation, radiation-detector development, and contaminated-air monitoring techniques. J.E.T.

N64-11351 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM MEDITSINSKAYA GAZETA (MEDICAL GAZETTE) [MOSCOW] 12 APRIL 1963
29 May 1963 14 p Transl. into ENGLISH of two articles p 2
(JPRS-19490; OTS-63-21958) OTS: $0.50

CONTENTS:

1. WHERE THE COSMONAUTS LANDED V. G. Volovich p 1–6
2. SPACE AND PROBLEMS OF GRAVITATION P. Isakov p 7–11

N64-11364 Cornell Aeronautical Lab., Buffalo, N.Y.
1963 REPORT ON RESEARCH
Ira G. Ross et al [1963] 38 p refs

The status of the electronics, applied physics, hypersonic research, operations and systems research, and vehicular research programs is discussed. J.E.T.

N64-11400 Canaveral Council of Technical Societies, Fla.
CONFERENCE PROCEEDINGS ON THE CHALLENGING PACE OF THE RACE TO SPACE, DAYTONA BEACH, FLORIDA, OCTOBER, 1962
James R. Duffett et al [1962] 88 p

Five areas of interest in the Nation's space program are discussed. These are: (1) the economic aspect, (2) the requirements of industry, (3) present and future space science and technology, (4) education, and (5) methods for closing the gap between Government and industry. I.v.L.

N64-11421* National Aeronautics and Space Administration, Washington, D.C.
EIGHTH SEMIANNUAL REPORT TO CONGRESS 1 Jul-31 Dec. 1962
James E. Webb [5 Dec. 1963] 208 p refs
GPO: $1.25

Progress reported in the Saturn I, Mercury-Atlas, Mariner II, Alouette, Explorer, Telstar, Tiros, and Relay projects includes: current research toward developing dependable launch vehicles, better propulsion systems, and manned space flight systems; scientific space investigations; applications programs; advanced research and technology; nuclear propulsion and space power systems; tracking and data acquisition; and management and support functions. D.E.R.

02 AERODYNAMICS OF BODIES, COMBINATIONS, AND INTERNAL FLOW

Includes aerodynamics of channels, cowls, ducts, ejectors, nozzles, etc. *For related information see*: 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 11 Fluid Mechanics.

N64-10983 Aeronautical Research Labs., Melbourne (Australia)
AN OIL BURNING SMOKE PRODUCER FOR FLOW INVESTIGATION IN A LOW SPEED WIND TUNNEL
A. E. Hodges Jul. 1962 16 p
(ARL/A-202)

The smoke producer was developed for use in the 9 ft × 7 ft low-speed wind tunnel, and has many advantages over kerosene, oiled cloth, pyrotechnic, and fuming types of smoke producers. The system requires a simple electric hot plate and a low pressure compressed air supply. The important characteristics of these units are: (1) after a 30 minute warm up period, any desired volume of smoke at any pressure can be obtained immediately, and operation is continuous; (2) the unit is very clean, simple, and safe to operate. Since it does not have any moving parts which might coke up, it is very reliable; (3) the output of the Mark III unit proved adequate for use in smoke stack efflux tests with tunnel speeds up to 50 fps, and for use in a 21-in.-square working section smoke tunnel over the same speed range. Author

N64-11026 Massachusetts Inst. of Tech., Cambridge Aeroelastic and Structures Research Lab.

SUPERSONIC FLUTTER OF RECTANGULAR ORTHOTROPIC PANELS WITH ARBITRARY ORIENTATION OF ORTHOTROPICITY

John M. Calligeros and John Dugundji Jun. 1963 86 p
(Contract AF 49(638)-219)
(ASRL-TR-74-5; AFOSR 5328; AD-421977)

Solutions are obtained using the Principle of Minimum Potential Energy together with a sixteen-mode Rayleigh–Ritz procedure. Damped flutter boundaries are found by the Movchan–Houbolt method. Calculations are performed for two example orthotropically stiffened panels and for a basic unstiffened isotropic panel. The flutter boundary is generally, but not always, reduced when the principal axes are rotated from the free-stream direction. Damping and length–width ratio play important roles in determining the flutter, and the modes which participate. The presence of slight damping is shown to raise significantly the flutter boundary resulting from "weak coalescences". It is concluded that aligning stiffeners parallel to the airstream direction is not always the preferred orientation. A preferred orientation depends on length–width ratio, amount of damping, and amount of orthotropicity present. Author

N64-11078* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena

A STUDY OF THERMAL SCALE MODELING TECHNIQUES

J. M. F. Vickers 30 Sep. 1963 22 p refs
(NASA Contract NAS7-100)
(NASA CR-52598; JPL-TR-33-153) OTS: $2.60 ph, $0.86 mf

The techniques which may be evolved from the basic laws of thermal scale modeling for spacecraft are described. All but two of these techniques can be rejected at once, since they require conditions which are very difficult to fulfill in practice. A comparison is drawn between the two remaining techniques, the technique of preserving temperature from prototype to model, and of preserving materials from prototype to model. It is found that, for steady-state conditions, the technique of preserving temperature has inherent advantages over that of preserving materials, but that when transient conditions are to be modeled much of this advantage is lost. Author

N64-11143 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

ON THE USE OF ROTATING DIFFUSOR APPARATUSES IN CENTRIFUGAL COMPRESSOR MACHINES

S. P. Livshits 22 Aug. 1963 15 p ref Transl. into ENGLISH Teploenerg. (Moscow), no. 3, 1962 p 25–29
(FTD-TT-63-809/1+2; AD-420761)

Results are presented of experimental research of compressor stages in which the angle of the setting of the input edges of the diffusor apparatus changes, in accordance with the change in the direction of the flow in passing from one mode of operation to another. Author

N64-11154 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

TURBULENT CIRCULAR AND FLAT STREAMS DEVELOPING IN A COUNTERFLOW

E. Timma 24 May 1963 15 p refs Transl. into ENGLISH from Izv. Akad. Nauk Eston. SSR, Ser. Fiz.-Mat. I Tekh. Nauk, no. 4, 1962 p 253–262
(FTD-TT-63-372/1+2+4; AD-409722)

The development of turbulent streams in a counterflow was investigated experimentally with particular emphasis on the initial section of the stream in which a potential flow core exists and on the transient section of the stream in which rearrangement of the stream structure ends. The main section of the isothermal stream developing in a counterflow was investigated to a lesser degree because other detailed studies of this section have been made previously. In the tests, the stream velocity was varied from 13 to 20 m/sec while the average velocity of the counterflow remained constant at 6.7 m/sec. Formulas are derived for obtaining (1) profiles of dimensionless excess velocity in different cross sections throughout a stream, (2) profiles of dimensionless excess velocity in the main section of a circular or flat stream, (3) profiles of dimensionless excess temperature, and (4) the long range of circular and flat streams developing in a counterflow. M.P.G.

N64-11187 ARO, Inc., Arnold Air Force Station, Tenn.

INVESTIGATION OF TWO-NOZZLE CLUSTER DIFFUSER-EJECTOR WITH AND WITHOUT EJECTED MASS [Technical Documentary Report, Dec. 4, 1961-Apr. 4, 1962

James W. Hale Arnold Eng. Develop. Center, Nov. 1963 65 p refs
(Contract AF 40(600)-1000)
(AEDC-TDR-63-130; AD-422419)

An investigation was conducted to determine the best shape for a diffuser-ejector configuration for a two-nozzle cluster rocket, and included the performance of various combinations of configurations derived from six basic diffuser-ejector geometric shapes and sizes, and four basic arrangements of nozzle configurations. The obround diffuser performed better than the circular diffuser of equal cross-sectional area for the two-nozzle cluster configuration. The starting and operating pressure ratios for the straight diffuser configurations varied with diffuser length-to-diameter ratio. For the two configurations tested, the presence of a second throat with a contraction ratio of approximately 0.60 produced an improvement of approximately 15 percent in the cell-to-chamber pressure ratio. The small duct-to-nozzle throat area ratio configurations gave isentropic and better cell-to-chamber pressure ratios, whereas the large duct-to-nozzle throat area ratio configurations gave greater than isentropic cell-to-chamber pressure ratios (as high as 1.62 times the one-dimensional isentropic value). An improvement by a factor of 10 in cell-to-chamber pressure ratio was accomplished for the small duct-to-nozzle throat area ratio configurations by auxiliary jet pumps ejecting as little as 0.45 percent of the simulated rocket mass flow from the test cell. Author

N64-11239 Grumman Aircraft Engineering Corp., Bethpage, N.Y.

AN APPROXIMATION TO THE ASYMMETRIC FLOW OVER CONES

John W. Brook Aug. 1963 30 p refs
(RM-221)

An approximate solution for the flow over nearly axisymmetric cones at hypersonic velocities has been developed. The method corrects the "identical-cone" method for curvature effects and includes, within the assumptions made, a description of the velocity field. Fair agreement is obtained in comparison with experiment and other approximate results for pressure distributions. Author

N64-11240 Lockheed Missiles and Space Co., Sunnyvale, Calif.
EQUILIBRIUM TOTAL RADIATION MEASUREMENTS IN AIR AT SUPERORBITAL ENTRY VELOCITIES Technical Report: Flight Sciences
H. Hoshizaki Oct. 1963 32 p refs
(LMSC-6-90-63-97)

An experimental investigation was carried out to obtain data on the total radiance of air at elevated temperatures. The experiment was performed in a 3-in. ID combustion-driven shock tube. The heat-transfer model used in this investigation was a flat-nosed cylinder approximately 1.13 in. in diameter. The radiation from the gas in the shock layer was measured by a thin-film gage placed behind a quartz window. The gage was placed about 0.5 in. behind the quartz window so that the radiating gas which the gage sees is a truncated cone with height equal to the shock-detachment distance. The data obtained are in good agreement with theoretical predictions. Author

N64-11253 Stanford U., Calif.
THE FLOW DEVELOPMENT AND HEAT TRANSFER CHARACTERISTICS OF PLANE TURBULENT IMPINGING JETS Technical Report No. 3
J. J. Schauer and R. H. Eustis 30 Sept. 1963 97 p refs
(NSF Grant 9705)

The investigation of plane, turbulent, impinging jets was concerned with the flow of air from a two-dimensional, converging nozzle striking a flat plate eight or more nozzle exit widths away. Nozzle exit velocities were less than one-fifth the speed of sound. The effects of the nozzle exit velocity and the position of the nozzle relative to the plate on the static pressure distribution, the velocity field, the boundary-layer growth, and the wall shear stress were determined analytically by integral methods and experimentally by static pressure tap and total head probe measurements. The heat-transfer characteristics of these flows were determined analytically for arbitrary ambient and jet exit temperatures and for arbitrary wall-temperature distributions. Author

N64-11283 Weapons Research Establishment (Australia)
FLOW CALIBRATION IN WIND TUNNEL S1
A. D. Mc Ronald, M. L. Robinson, and E. R. A. Landers Jun. 1963 42 p refs
(HSA-75)

Mach number distributions, and flow angle variations in the pitch plane have been measured in the working section of the 15-in. × 15-in. supersonic wind tunnel S1. Mean Mach numbers and variations from the respective means are tabulated, and comprehensive results in graphical form are presented for the Mach number range 1.4 to 2.8 in nominal steps of 0.2. These results indicate that the quality of the flow in the working section of wind tunnel S1 compares favorably with that in other tunnels of similar size and Mach number range. Design ordinates are given for each nozzle block and the maximum departure of the actual profile from the design figures is indicated. Author

N64-11292 General Electric Co., Philadelphia, Pa. Space Sciences Lab.
COMPARISON OF TURBULENT WAKE CHARACTERISTICS WITH DIFFERENT EDDY VISCOSITY COEFFICIENTS
K. S. Wan 1 Nov. 1963 17 p refs
(R63SD71)

The results of the equilibrium turbulent wake characteristics of a slender cone with different forms of eddy viscosity coefficient are presented. Comparisons of these results show that the form of the eddy vicosity coefficient affects the wake characteristics significantly. Author

N64-11301 Lehigh U., Bethlehem, Pa. Inst. of Research
A STUDY OF THE WALL BOUNDARY CONDITION AND MICROSCOPIC FLUCTUATIONS IN LAMINAR PIPE FLOW BY TRACER PHOTOGRAPHY
Richard M. Elrick II 1 Oct. 1963 104 p refs
(NSF Grant 19713)
(Tech. Rept. 17)

A high-precision, high-resolution tracer technique was used to study low-noise, steady laminar airflow in a 1 1/2-inch by 1/2-inch rectangular pipe. The tracers were sub-micron size cigarette-smoke particles, which were injected into the flow and illuminated by chopping light from a carbon arc lamp allowing their trajectories to be photographed. Micron-size fluctuations were observed in all the flow regions. Anisotropic fluctuation behavior was observed; reasons for this are discussed. Other predictions of Einstein's Brownian motion theory are tested in detail, and found in close accord with the observed data. Trends are evident in the data which indicate that the microscopic fluctuation level may increase above the Brownian level as the flow speed and velocity gradient increase. J.E.T.

N64-11334* Avco Corp., Wilmington, Mass. Research and Advanced Development Div.
THEORETICAL PREDICTION OF THE EQUILIBRIUM REAL GAS INVISCID FLOW FIELDS ABOUT BLUNT BODIES, PHASE II Formal Written Report
Jun. 1963 27 p refs
(NASA Contract NAS9-858)
(NASA CR-52876) OTS: $2.60 ph, $1.01 mf

Two theoretical predictions of the equilibrium real-gas inviscid flow fields about blunt bodies are discussed: (1) the method of integral relations for real-gas flow over an axisymmetric body at large angles-of-attack—general equations and a method of solution for a sinusoidal distribution in θ (leeward plane of symmetry) and (2) flow field determination in the subsonic region at zero angle-of-attack—a short description of the mathematical basis of the approach of Garabedian and Lieberstein. P.V.E.

03 AERODYNAMICS OF WINGS, ROTORS, AND CONTROL SURFACES

Includes ailerons; airfoil sections; cascades; fans; flaps; propellers; rotors; slats; spoilers; etc. ***For related information see:*** **02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 11 Fluid Mechanics.**

N64-10932* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif..
A WIND-TUNNEL INVESTIGATION OF GROUND-WIND LOADS ON AXISYMMETRIC LAUNCH VEHICLES
Donald A. Buell, George B. Mc Cullough, and William J. Steinmetz Washington, NASA, Oct. 1963 210 p refs
(NASA TN D-1893) OTS: $3.50

The tests simulated steady ground winds on a family of models representing launch vehicles on the launching pad. Both the bending-moment response and the aerodynamic input to the models were measured at Reynolds numbers up to 10 million (based on the diameter of the upper stage). The results are analyzed and discussed to reveal the effects of many aerodynamic and structural variables, and to indicate the statistical and spectral nature of the phenomena. Author

N64-11238 National Physical Lab., Teddington (Gt. Brit.) Aerodynamics Div.
AN EXPERIMENTAL INVESTIGATION OF ASYMPTOTIC HYPERSONIC FLOWS
N. C. Freeman, R. F. Cash, and D. Bedder 10 Jan. 1963 10 p refs
(NPL-AERO 1051; HYP 288; ARC 24429)

Shock-wave shapes on a series of blunt-nosed power-law bodies ($y \propto x^m$) in a hypersonic stream ($M_\infty = 8.8$) are analyzed and compared with theory. Results indicate that shock-wave growth exponent varies uniformly with body-shape exponent in the range $0 < m < 1$. Author

N64-11246* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATOR STUDIES OF THE MANUAL CONTROL OF VEHICLE ATTITUDE USING AN ON-OFF REACTION CONTROL SYSTEM
Armando E. Lopez and Donald W. Smith Washington, NASA, Dec. 1963 27 p refs
(NASA TN D-2068) OTS: $0.75

An investigation was conducted to determine the effects of controller configuration, control power, control-power ratio between axes, and motion stimulus on the fuel consumption during a manual attitude stabilization task with an on-off reaction control system. At the maximum control power tested, an order of magnitude less fuel was used with a three-axis finger-tip controller than with a two-axis pencil controller with toe pedals. Author

04 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc., and specific types of complete aircraft (e.g., Ground Effects Machines, Flexible Wings, STOL, and VTOL); flight tests; operating problems; safety devices; and stability and control. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 30 Space Vehicles.

N64-10775 Joint Publications Research Service, Washington, D.C.
IL-62 – THE WINGED GIANT
Ion Trofin *In its* Transl. from Stiint. si Tech., (Sci. and Technol.) [Bucharest] v. 14, [no. 9 and no. 11] Sep.–Nov. 1962 (Air Transport and Space Sci.) 4 Apr. 1963 p 4–10 (See N64-10773 02-01) OTS: $0.75

A description of the turbojet plane IL-62 is presented. The IL-62 airplane is a monoplane with four turbojet engines mounted in horizontal pairs on each side of the fuselage behind the wing and has a cruising speed of 900 kilometers per hour fully loaded. The fuselage of metallic construction is a monocoque and consists of two parts—the front part contains compartments for the crew and passengers and the rear part is where the engines are mounted. The tail is arrow-shaped with the horizontal tail placed on top of the vertical tail. The IL-62 has a tricycle landing gear and a fuel capacity sufficient for nonstop flights from Moscow to New York, with a fuel reserve for an additional hour. P.V.E.

N64-10899 Deutsche Forschungsanstalt für Hubschrauber und Vertikalflugtechnik Stuttgart (W. Germany)
THE VARIOUS MASS- AND AERODYNAMIC-COUPLING EFFECTS IN THE STABILITY AND CONTROL PROBLEMS OF HELICOPTERS [DIE VERSCHIEDENEN MASSENKOPPELEFFEKTE UND AERODYNAMISCHEN KOPPELEFFEKTE BEI DEN STABILITATS- UND STEUERUNGSPROBLEMEN VON HUBSCHRAUBERN]
W. Just 15 Aug. 1963 50 p refs In GERMAN Presented at the Ann. Meeting of the Wiss. Ges. für Luft- und Raumfahrt, Munich, 8–12 Oct. 1963
(*Its* Ber. 71)

The various degrees of freedom and the various theories for helicopter stability and control calculations are discussed, and the equations of motion for helicopters are given. These equations are: three equations of force, three moment equations, the motion equation for the loose control, the motion equation for the rotor torque, the hammering motion equation, and the rotating motion equation. Also, the individual mass coupling elements and the numerous aerodynamic coupling elements are described. In addition, a diagram for determining derivatives with coupling elements is presented. Finally, the effect of coupling elements on stability and control, based on motion curves derived from calculations and from flight measurements, is shown. Trans. by I.v.L.

N64-10900 Entwicklungsring Süd, Munich (W. Germany)
OPTIMIZATION OF VTOL-FLIGHT CONTROL CHARACTERISTICS IN HOVERING [OPTIMIERUNG DER EIGENSCHAFTEN VON VTOL-FLUGREGLERN IM SCHWEBEFLUG]
W. Burkhardt Sep. 1963 29 p refs
(EWR-89-63)

This review begins with a short summary of the most critical demands on the attitude of VTOL-aircraft during hovering, according to criteria formulated in the U.S.A. Next, an illustration is presented, for determining the suitable magnitudes for characterizing the hovering attitude, by means of pictorial diagrams of the control circuit. The application of the maneuverability criteria to an experimental flight instrument of the EWR is illustrated in which the experience gained from various types of controls and from adjustments on the VTOL-control is mentioned. In evaluating the flight attitude, pilot statements and recordings were used. Also, difficulties in constructing VTOL flight controllers, according to given specifications, are discussed. Trans. by I.v.L.

N64-10971 Entwicklungsring Süd, Munich (W. Germany)
INSTRUMENT FLIGHT SIMULATION STUDIES OF THE EFFECT VANES ON THE FLIGHT CONTROL OF HOVERING AIRCRAFT [REGELTECHNISCHE UNTERSUCHUNGEN UBER DEN EINFLUSS DES STELLGLIEDES IN SCHWEBEFLUGSTEUERUNGEN]

Hans M. Franke and G. Dopner Sept. 1963 38 p refs In GERMAN Presented at the Ann. Meeting of the Wiss. Ges. für Luft-und Raumfahrt, Munich, 8–12 Oct. 1963
(EWR 101-63)

The deterioration in pilot judgment of flight characteristics, which sets in under increasing saturation and time-delay in a vane, is determined by means of a simple simulator with a recording instrument. The vane is representative of the control nozzle or of the thrust engine used in control. Beginning with the desired time and frequency relationship between the control- and timing-system for a given aircraft, the criteria for evaluating the velocity control and the attitude control are investigated. Results indicate that the use of the simple simulator does not demonstrate whether velocity control or attitude control is preferable. The simulator does show that both velocity control and attitude control can be optimized. Results of flight tests indicate that attitude control lessens the strain on the pilot, and is best suited for instrument flying. Trans. by I.v.L.

N64-11429 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
ON OPTIMAL REGIMES OF AEROSPACE VEHICLE MOTION
E. V. Tarasov [1963] 16 p refs Transl into ENGLISH from Izv. Vysshikh. Ucheb. Zavedenii Aviats. Tekh. (USSR), no. 3, 1963 p 34–42
(*Its* Transl. 483)

This report discusses the investigation of the optimum throttling regime of a powerplant by the indirect method of the calculus of variations. The purpose was to determine the throttle characteristics of the powerplant of a vehicle performing maneuvers such that one of the intrinsic parameters of motion (such as speed, altitude, range, time of flight, weight, etc.) attains an extremum. The investigation was conducted under the following assumptions. (1) The vehicle is a mass particle of variable mass, and its moments of inertia can be disregarded. (2) The motion occurs in one plane, and is stable. (3) The dynamic characteristics do not impose any restrictions on the power consumed by the regulation system of the powerplant and by the control system of the vehicle. I.v.L.

05 ASTRONOMY AND ASTROPHYSICS

Includes celestial mechanics; and radioastronomy. *For related information see*: 12 Geophysics, and 29 Space Sciences.

N64-10809 Joint Publications Research Service, Washington, D.C.
SOVIET REPORTS ON METEOR OBSERVATION BY RADAR
V. G. Kruchinenko et al 30 Apr. 1963 25 p refs Transl. into ENGLISH from Sb. Rabot po Mezhdunarodnomu Geofiz. Godu (Kiev), no. 1, 1961 p 26–36 and 49–51
(JPRS-18986; OTS-63-21724) OTS: $0.50

CONTENTS:

1. RADAR OBSERVATIONS OF METEOR STREAMS V. G. Kruchinenko, R. I. Moysya, and I. V. Bayrachenko p 1–17 refs (See N64-10810 02-05)

2. APPARATUS FOR EXPERIMENTAL INVESTIGATION OF THE SCATTERING OF RADIO WAVES BY METEOR TRAILS I. V. Bayrachenko, and Ye. D. Podogorodetskiy p 18–22 refs (See N64-10811 02-05)

N64-10810 Joint Publications Research Service, Washington, D.C.
RADAR OBSERVATIONS OF METEOR STREAMS
V. G. Kruchinenko, R. I. Moysya, and I. V. Bayrachenko *In its* Sov. Rept. on Meteor Observation by Radar 30 Apr. 1963 p 1–17 Transl. into ENGLISH from Sb. Rabot po Mezhdunarodnomu Geofiz. (Kiev), no. 1, 1961 p 26–36 (See N64-10809 02-05)

The role of the U.S.S.R. in the IGY and IGC program in solving by radar observation the problem of recording meteor activity and explaining the relative role of meteors in the E layer of the ionosphere is discussed. The method of processing observational results, as well as the results of the observations, is examined. A discussion of the various recognized values of the relative distribution of the large and small bodies in the meteor stream is included. J.E.T.

N64-10811 Joint Publications Research Service, Washington, D.C.
APPARATUS FOR EXPERIMENTAL INVESTIGATION OF THE SCATTERING OF RADIO WAVES BY METEOR TRAILS
I. V. Bayrachenko and Ye. D. Podgorodetskiy *In its* Sov. Rept. on Meteor Observations by Radar 30 Apr. 1963 p 18–22 refs Transl. into ENGLISH from Sb. Rabot po Mezhdunarodnomu Geofiz. Godu (Kiev), no. 1, 1961 p 49–51 (See N64-10809 02-05)

The circuitry and component functions of the radar indicating-recording device used for investigating the dispersion of radio waves by meteor trails are presented. J.E.T.

N64-11114* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODES OF MASS EJECTION BY BINARY STARS AND THE EFFECT ON THEIR ORBITAL PERIODS
Su-Shu Huang Repr. from Astrophys. J., v. 138, no. 2, 15 Aug. 1963 p 471–480
(NASA RP-77)

Three modes of mass ejection from one or both components of a binary system have been idealized and their physical characteristics discussed, in order to predict their effect on the orbital period of the system. Also, the consequence of synchronization of axial rotation of components stars with their orbital revolution is examined. Author

N64-11197* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRANSFER OF ANGULAR MOMENTUM BETWEEN PARTICLES AND THE BINARY SYSTEM
Su-Shu Huang Repr. from Astrophys. J., v. 138, no. 2, 15 Aug. 1963 p 481–486 refs
(NASA RP-82)

Transfer of angular momentum between the ejected particle and the binary system itself has been studied numerically in the framework of the restricted three-body problem, and the general behavior of such transfer for particles of high velocities of ejection is elucidated. Tables are given for the angular momentum that will be carried away to infinity under various initial conditions of ejection. Author

N64-11201* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TIDAL DISSIPATION IN THE MOON
William M. Kaula Repr. from J. Geophys. Res., v. 68, no. 17, Sep. 1963 p 4959–4965 refs
(NASA RP-36)

Dissipation of tidal energy in the moon was calculated under the assumption that it can be represented as due to imperfect elasticity. If the factor $1/Q$ for dissipation per cycle is assumed to be 1/100 for distortional strain energy and 1/1000 for dilatational strain energy, the heat now being generated in the moon by tides is less than 0.010 erg/g/yr; i.e., negligible compared to radioactive heating by a chondritic composition. Tidal heating would be comparable to radioactive heating, however, if the semimajor axis of the moon's orbit was one-third as great, so the mechanism does limit the possible history of the moon's orbit. Also, appreciable tidal dissipation would cause thermal stresses and be conducive to convection, since it is much greater in the center than near the surface of the moon, and has a nonuniform distribution in latitude (and longitude as well, if rotation is synchronous with revolution). Author

N64-11222 Joint Publications Research Service, Washington, D.C.

TELEVISION PHOTOGRAPHY OF THE MOON

N. F. Kuprevich 18 Jul. 1963 11 p refs Transl. into ENGLISH of an article from Priroda (Moscow), no. 4, 1963 p 90–93
(JPRS-20223; OTS-63-31315) OTS: $0.50

Experiments on the use of infrared vidicons for photographing the moon are described. In photographing the image of the moon in the infrared region, using the television system, a series of transformations occurs. A block diagram of the television telescope with infrared vidicon is given. R.T.K.

N64-11257* New Mexico State U., University Park

AMERICAN ASTRONOMERS REPORT

Bradford A. Smith Repr. from Sky and Telescope, v. 26, no. 4, Oct. 1963 1 p Highlights of papers presented at the 114th Meeting of the Am. Astron. Soc., College, Alaska, Jul. 22–24, 1963
(NASA Grant NsG-142-61)

The difficulties in direct determination of the diameter of Venus are discussed. R.T.K.

N64-11294* New Mexico State U. University Park

CONTINUED PHOTOGRAPHIC PATROL AND STUDY OF THE PHYSICAL CONDITIONS ON THE MOON AND PLANETS Semi-Annual Report No. 5, 15 Apr.–14 Oct. 1963

Clyde W. Tombaugh [1963] 5 p
(NASA Grant NsG-142-61)
(NASA CR-52850) OTS: $1.10 ph, $0.80 mf

During most of this period, both Venus and Mars were unfavorably placed for effective observation. Saturn was quiescent as evidenced by scarcely any change of markings on the disk. On the other hand, Jupiter was extemely active with many rapid changes in the markings, which were well observed under the very favorable circumstances of a perihelion opposition occurring once in 12 Earth years. Author

N64-11312 Padua U (Italy) Astrophysical Observatory

RESEARCH ON NEBULAR VARIABLES, NOTE 3: STUDIES OF VARIABLE STARS IN THE REGION OF NGC 1999 [RICERCHE SULLE VARIABILI NEBULARI, NOTA 3: STUDIO DELLE STELLE VARIABILI NELLA ZONA DELL'NGC 1999]

Paolo Maffei 1963 25 p refs In ITALIAN; ENGLISH summary
(*Its* Contrib. dell'Osservatorio Astrofisico 136)

From January 1957 to December 1961, 211 plates centered on NGC 1999 were obtained with the 60-cm reflector of Loiano (Bologna), and the 122-cm reflector of Asiago. The field includes the Herbig-Haro objects and several variable stars. Two new flare stars have been discovered. Thirty-six infrared plates have allowed, for the first time, a comparison of the light-curves of variable stars in this radiation and in blue light. The preliminary results indicate a real difference of the light curves and amplitudes in the two colors. The control of the Herbig-Haro objects has not revealed any perceptible variation during the period of observations. Author

N64-11339* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

VARIATION OF STRONTIUM ISOTOPES IN TEKTITES

C. C. Schnetzler and W. H. Pinson, Jr. (MIT) [1963] 39 p refs
(NASA TM X-51168; MIT 39) OTS: $3.60 ph, $1.37 mf

The range of $\mathrm{Sr}^{87}/\mathrm{Sr}^{86}$ ratios in 18 tektites is from 0.7121 to 0.7223. This range is quite small compared to the range found in nature, in general agreement with previous studies of oxygen and silicon isotopes in tektites. Rb and Sr contents of tektites from a give locality are very similar, but differences exist between localities. There is indicated, however, a sympathetic variation of the $\mathrm{Sr}^{87}/\mathrm{Sr}^{86}$ and Rb/Sr ratios; i.e., the tektite groups have age values of approximately 400 m.y. If tektites were derived from the moon, and surface of the moon is old (4.5 b.y.), the observed $\mathrm{Sr}^{87}/\mathrm{Sr}^{86}$ ratios could not have been developed by a chondritic, granitic, or tektitic surface material but could have been generated by a basaltic-type material. However, production of tektites from a basaltic-type surface material during a high-temperature fusion implies extreme fractionation in a direction contrary to expectation. Author

N64-11392 Boston U., Mass.

IMPACTS ON THE EARTH AND MOON

Gerald S. Hawkins Repr. from Nature, v. 197, no. 4869 23 Feb. 1963 p 781 refs (Supported by NASA)

The equations for the number of meteorites with an initial mass greater than m_∞ (kg) that collide with the earth and moon are derived. For the earth, these are: stone meteorites: $\log_{10}N = -3.73 - \log_{10}m_\infty$; iron meteorites: $\log_{10}N = -5.61 - 0.7 \log_{10}m_\infty$. These equations are derived from existing data, assuming that 90% of a stone meteorite, and 80% of an iron meteorite are ablated, and that 9 out of 10 average meteorites are stoney, but that the larger meteorites are predominantly iron. The rates for impact with the surface of the moon are assumed to be one-half of the rates for the earth, allowing for the size of the two bodies and the gravitational effect of the earth. Assuming the above equations to be true for the past, the maximum size of an object that has ever collided with the earth is of mass 10^{17} kg. The moon has probably suffered one collision with an object comparable in size to Eros, 10^{16} kg. D.E.R.

N64-11394* Pennsylvania State U., University Park

THE HELIUM CONTENTS OF METALLIC METEORITES

Carl August Bauer Repr. from J. of Geophys. Res. v. 68, no. 21, 1 Nov. 1963 p 6043–6057 refs
(NASA Grant NsG-23-59)

The He^3 and He^4 concentrations were measured in 53 samples taken from 34 different metallic meteorites. Two meteorites were identified, Deep Springs and Clark County, that have considerably higher helium concentrations than any previously measured. The hexahedrites Edmonton and Braunau probably have the lowest $\mathrm{He}^3/\mathrm{He}^4$ ratio yet found, with the possible exception of selected samples from Washington County. The exposure ages relative to Grant were estimated for 25 of the meteorites. The estimates for the 3 oldest are: Deep Springs 1550; Piñon, 1140; and Clark County, 1050 m.y. The lowest age found in this study was 40 m.y. for Monahans. The helium concentrations in the meteorites of low nickel content are lower than those in the medium octahedrites. The hexahedrites, as a class, have especially low helium concentrations and low ratios, but this study did reveal two hexahedrites, Iredell and Cedartown, that have higher helium concentrations and normal ratios. Author

N64-11408 California Inst. of Tech., Pasadena Owens Valley Radio Observatory

AN ATTEMPT TO MEASURE THE GALACTIC MAGNETIC FIELD

D. Morris, B. G. Clark, and R. W. Wilson 1963 10 p refs (Contract Nonr-220(19))

This paper describes measurements made in November 1961 and February 1962 in an attempt to determine the galactic magnetic field by the Zeeman splitting of the 21-cm line. The present observations were confined to two absorption lines, one in the spectrum of Cas A (at a frequency of ≈ 0 kc with respect to the natural line frequency, after correction to the local standard of rest) and the other in the spectrum of the Crab Nebula (at a frequency of ≈ -50kc.) Author

N64-11424 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group

THE DETERMINATION OF THE NON-UNIFORMITY OF THE ASTRONOMICAL TIME BY MEANS OF A MOLECULAR GENERATOR

M. D. Sopel'nikov [1963] 15 p refs Transl. into ENGLISH from Astron. Zhur. Akad. Nauk SSSR (Moscow), v. 39, no. 2, 1962 p 355-361

(*Its* Transl. 416)

The results of the application of a molecular standard for the determination of the nonuniformity of astronomical time are given. The method of reduction for deriving gradual and seasonal variations in the length of a day, and also the corrections for transition from UT-1 to UT-2 are described. The corrections for transition from the readings of a quartz clock to that of a molecular clock are tabulated. Author

06 AUXILIARY SYSTEMS

Includes fuel cells and solar cells; gas turbines; hydraulic, pneumatic and electrical control systems and actuators; and inverters. *For primary propulsion systems see*: 27 Propulsion. *For related information see*: 08 Communications; 09 Electronics; 10 Facilities, Research and Support; 15 Instrumentation and Photography; and 22 Navigation and Guidance.

N64-10696 Joint Publications Research Service, Washington, D.C.

STUDY OF REDUNDANT AUTOMATIC SYSTEMS

12 Feb. 1963 49 p refs Transl. into ENGLISH of three articles from Izv. Akad. Nauk SSSR, Otd. Tekhn. Nauk: Energ. i Avtom. (Moscow), no. 6, Nov. - Dec. 1962 p 150-170 refs (JPRS-17577; OTS-63-21098) OTS: $1.25

CONTENTS:

1. THE READINESS FACTOR AND OPTIMUM CHECKING PERIOD FOR REDUNDANT AUTOMATIC SYSTEMS A. A. Slepov p 1-13 refs (See N64-10697 02-06)
2. RELIABILITY OF REDUNDANT APPARATUS A. L. Garkavi and V. B. Gogolevskiy p 14-39 refs (See N64-10698 02-06)
3. THE QUESTION OF FRACTIONAL REDUNDANCY I. P. Paderno p 40-46 refs (See N64-10699 02-06)

N64-10697 Joint Publications Research Service, Washington, D.C.

THE READINESS FACTOR AND OPTIMUM CHECKING PERIOD FOR REDUNDANT AUTOMATIC SYSTEMS

A. A. Slepov *In its* Study of Redundant Autom. Systems 12 Feb. 1963 p 1-13 refs (See N64-10696 02-06)

Systems are put in reserve in order to assure uninterrupted operation of automatic systems. The reliability of important reserve systems is expressed by the readiness factor, i.e., the probability that the reserve apparatus is in proper operating order at any moment of time. The readiness factor of a redundant system, consisting of successively connected units, was examined. If any element of a unit goes out of order, the entire system goes out of order. Failures of the system were found to occur according to the Poisson distribution; and the exponential law of reliability is valid. A mathematical expression was derived and is given for the optimum period for checking the reserve apparatus. R.T.K.

N64-10698 Joint Publications Research Service, Washington, D.C.

RELIABILITY OF REDUNDANT APPARATUS

A. L. Garkavi and V. B. Gogolevskiy *In its* Study of Autom. Systems 12 Feb. 1963 p 14-39 refs (See N64-10696 02-06)

The reliability of a system consisting of a given number of identical apparatus is examined. It is assumed that the system functions properly during the course of a certain period of time, if, at any moment of this period of time, at least one apparatus is operating properly. The question which is investigated most thoroughly is that of the reliability of a system consisting of two apparatus (doubled apparatus). For such systems, in all the cases which were investigated, formulas were obtained for calculation of the reliability or average time of the correct operation. For systems consisting of more than two apparatus, the ways of obtaining the computation formulas are indicated for some cases. The methods of redundancy which were examined encompass cases where the time of proper operation follows the exponential law. R.T.K.

N64-10699 Joint Publications Research Service, Washington, D.C.

THE QUESTION OF FRACTIONAL REDUNDANCY

I. P. Paderno *In its* Study of Redundant Autom. Systems 12 Feb. 1963 p 40-46 refs (See N64-10696 02-06)

The problem examined is the evaluation of the reliability of redundancy in those cases where the ratio of the number of reserve systems to the number of redundant systems is not a whole number. Polvoko and Novikov have derived a formula for the probability of the continuous operation of a system consisting of a finite number of subsystems and a finite number of main (operating) systems; the numerical difference between the main systems and the subsystems represents the number of reserve systems. This formula is modified so as to be more convenient for practical use. R.T.K.

N64-10755 Joint Publications Research Service, Washington, D.C.

THE CLASSIFICATION OF AUTOMATION SYSTEMS ACCORDING TO CONTROL PRINCIPLES

O. I. Kukhtenko 25 Mar. 1963 29 p refs Transl. into ENGLISH of an article from Avtomatyka (Kiev), no. 6, 1962 p 67-78

(JPRS-18307; OTS-63-21398) OTS: $0.75

A distinction is made between two basic control principles—control by deviation and control by perturbations. These two systems are the basic principles of the theory of automatic control. The systems which are designed on the basis of combined utilization of these two principles are of great significance in solution of invariance problems. The treatment of the problem on dynamic equivalence of various control systems, and the conditions of equivalence of the two systems, are discussed. R.T.K.

N64-10876* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE SPACECRAFT POWER SUPPLY SYSTEM

D. G. Bomberger, D. Feldman, D. E. Trucksess, S. J. Brolin, and P. W. Ussery *In its* Telstar I, Vol. 1 Jun. 1963 p 943–972 refs (See N64-10868 02-01)

The power supply system in the Telstar spacecraft consists of a solar cell plant to convert solar radiation to electrical energy when the satellite is illuminated by the sun, a 19-cell nickel–cadmium battery to store energy, and a regulation circuit to supply constant output voltages over a wide variation in input voltages. Additionally, the power supply system provides switching to conserve power and allow battery recharging during periods between communications experiments. Author

N64-10901* Livingston Electronic Corp., Montgomeryville, Pa.

DEVELOPMENT OF HIGH ENERGY DENSITY PRIMARY BATTERIES, 200 WATT HOURS PER POUND OF TOTAL BATTERY WEIGHT MINIMUM First Quarterly Report, 21 May–19 Aug. 1963

W. F. Meyers, G. M. Armstrong, W. G. Hagenbuch, W. C. Merz, D. W. Klopp, et al 28 Oct. 1963 82 p refs
(NASA Contract NAS3-2775)
(NASA CR-52550) OTS: $8.10 ph, $2.66 mf

The objective of this research program is to develop a battery of 200 whr/lb of total battery weight. A selected study of recorded information was undertaken to seek out nonaqueous systems which are likely to yield high whr/lb. As a result of the literature study, the theoretical studies, and initial experimental work, three significant new areas of exploration have been uncovered. (1) An equation of state estimating the energy density capability of solvents in terms of three conveniently measured parameters has been evolved. (2) The availability of ion exchange membranes permits practical consideration of alkaline anolytes and acid catholytes within the same cell. (3) A new approach to the formation of conducting solutions in solvents of lower dielectric constant has been formulated. Author

N64-10905* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SILVER ZINC BATTERIES POWER SUPPLY FOR THE ATMOSPHERE STRUCTURE SATELLITE EXPLORER XVII

P. C. Donnelly and C. F. Palandati Oct. 1963 20 p refs
(NASA X-636-63-206; NASA TM X-51150) OTS: $1.60 ph, $0.80 mf

Silver zinc cells were utilized as the power supply for Explorer XVII because they offered the highest capacity per unit of weight of existing electrochemical couples. Tests to determine the feasibility of using these cells in a sealed sphere and under the expected power profile of the satellite were carried out. The electric power system used on the satellite, cell characteristics, and associated outgassing data are presented. Author

N64-10956* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

THERMAL RADIATION IN SPACE NUCLEAR ELECTRIC POWER SYSTEMS

Herman Schwartz *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 289–292 refs (See N64-10937 02-01) GPO: $3.50

The heat rejection temperatures for a number of space nuclear–electric powerplants fall within the temperature range of 450° to 1400° K. The characteristics of these powerplants, and the manner in which thermal radiation properties and surfacings affect their performance are discussed. Author

N64-10972 Entwicklungsring Süd, Munich (W. Germany)

RELIABILITY ANALYSIS OF AN AIRBORNE ELECTRICAL SUPPLY SYSTEM [ZUVERLASSIGKEITSANALYSE EINES ELEKTRISCHEN BORDNETZES]

Walter Mehnert Sep. 1963 21 p Presented at the Am. Meeting of the Wiss. Ges. Luft- und Raumfahrt, Munich, 8–12 Oct. 1963 In GERMAN
(EWR-103-63)

An analytical method for determining the reliability of a system, such as a network, from the reliability values of the components is described. This analysis considers element failure but not the dependency of this failure on time and on the switching sequence. I.v.L.

N64-11006 Joint Publications Research Service, Washington, D.C.

POWERFUL AC ELECTRIC POWER TRANSMISSION LINES FOR DISTANCE OF 1,500-3,000 KM

V. K. Shcherbakov 28 Feb. 1963 16 p refs Transl. into ENGLISH of an article from Izv. Sibirsk. Otd. Akad. Nauk SSSR (Novosibirsk), no. 10, 1962 p 51–59
(JPRS-17873; OTS-63-21222) OTS: $0.50

Half-wave uniform lines, i.e., aerial lines, which ensure practically uniform voltages at the line ends and high static stability under all conditions of its load, and which enable the power transmitted over the line to be brought to a value which is considerably greater than the natural power of a line, are proposed in an effort to eliminate the problems which arise in the development of powerful electric transmission lines for distances of 1500 to 3,000 km. This type of half-wave lines is considered to be the only type of ac electric-power-transmission lines which can solve the problems associated with transmitting power over distances from 1500 to 3,000 km, as needed by industrial complexes. The level of insulation in the middle of the line is the only limitation of the half-wave line, and it is felt that, with each improvement of the insulation, a leading effect of the growth of the transmitting capacity of the line will be yielded. C.L.W.

N64-11075* Air Products and Chemicals, Inc., Allentown, Pa.

RESEARCH AND DEVELOPMENT OF CRYOGENIC PROPELLANT FEED SYSTEMS FOR ELECTROTHERMAL ENGINES Monthly Progress Report No. 2, 9 Mar.–9 Apr. 1962

Robert B. Barclay 13 Apr. 1962 12 p
(NASA Contract NAS8-2573; APCI Proj. 03-1-4291)
(NASA CR-52726) OTS: $1.60 ph, $0.80 mf

The proposed flight plan of an electrothermal engine vehicle is presented. The goal is a 24-hour circular earth orbit of 22,000 nmi. Equations are given for constant pressure and constant flow conditions of the propellant, and for calculating the tank volume and initial propellant mass necessary to provide a given mass of usable propellant at constant pressure. Rate of heat addition considerations are included. J.E.T.

N64-11076* Gulton Industries, Inc., Hawthorne, Calif.
RESEARCH AND DEVELOPMENT STUDY ON DC TO DC CONVERTER, ENGINEERED MAGNETICS MODEL EMCR-131 First Quarterly Report, 1 Jul.-1 Oct. 1963
L. Hemphill [1963] 25 p
(NASA Contract NAS5-3470)
(NASA CR-52708; Rept. 1365)

This report covers the first phase of design of a high-efficiency dc to dc converter with a 59-watt output from four regulated isolated and short circuit protected outputs. Efficiency goals are: (1) 85% efficiency at full load (59 watts) for all input line voltages from 12 to 20 volts; (2) 80% efficiency at minimum load (12 watts) for all input voltages from 12 to 20 volts. Chief obstacles to achieving high efficiency are associated with transistor charge storage, and diode loss in output rectification circuits. Reduction in diode loss is being sought through fast recovery diodes, or transistors used as synchronous rectifiers. Author

N64-11081* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPONENT DESIGN, CONSTRUCTION AND EVALUATION FOR SATELLITES
D.S. Peck and M.C. Wooley *In its* Telstar I, Vol. 3 Jun. 1963 p 1665-1686 refs (See N64-11079 02-01)

Components for a high-reliability system such as the Telstar project are obtained by: (1) design of the component for the required environment, (2) careful control of manufacturing processes, (3) elimination of potential early failures by screening tests, and (4) selection of the most stable components. For passive components, these methods could be applied by using design parameters, suppliers and screening techniques established in the earlier submarine cable program, with consideration being given to the additional effects of the satellite launch and orbit environments. Semiconductor component designs were selected by qualification tests using accelerated electrical and environmental stress conditions. The recognition of the effect of ionizing radiation on transistors caused the addition of a radiation qualification test, or a screening to assure selection of the least sensitive devices. Author

N64-11082* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NICKEL-CADMIUM CELLS FOR THE SPACECRAFT BATTERY
D. C. Bomberger and L. F. Moose *In its* Telstar I, Vol. 3 Jun. 1963 p 1687-1702 refs (See N64-11079 02-01)

The storage battery for the Telstar satellite must undergo frequent charge-discharge cycles; in addition, it is subject to overcharge during a substantial portion of its life. Nickel-cadmium cells were chosen as best capable of satisfactory long-time operation under these conditions. A design and selection program was undertaken to ensure that Ni-Cd cores would meet objectives imposed by battery service conditions, and the cell enclosure was designed to minimize electrolyte leakage. Selection, qualification, and life tests indicated that a storage battery using the cell design would perform satisfactorily. To date, the only failures occurring during continuing life tests have been among cells subjected to 100 percent discharge daily; this operation is far in excess of the expected duty cycle of satellite cells. Author

N64-11085* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SOLAR CELLS AND THEIR MOUNTING
K. D. Smith, H. K. Gummel, J. D. Bode, D. B. Cuttriss, R. J. Nielsen, and W. Rosenzweig *In its* Telstar I, Vol. 3 Jun. 1963 p 1765-1816 refs (See N64-11079 02-01)

The Telstar solar cells use the n-on-p structure, in preference to conventional p-on-n structure, to obtain a factor of 3 to 10 increased life expectancy. Early estimates of electron and proton fluxes in the satellite orbit showed that even the best cells would not give sufficient life without radiation shielding. Therefore, the cells are protected against electrons of energy up to 1-Mev by 0.3 gm/cm^2 sapphire cover plates. The cell mountings are designed to withstand peak vibration stresses of 200 g and repeated temperature cycles from +65° C to −100° C. The 3600-cell solar powerplant is composed of 300 twelve-cell groups of 1 cm × 2 cm cells, yielding a nominal initial power of 14 w at 28 v for any spin-axis orientation relative to the sun. Telemetry information on performance of the solar plant indicates degradation of the shielded solar cells equal to that measured in the laboratory on unshielded cells with a 1-Mev normal incidence flux of 6×10^{12} electrons/(cm^2 day). From this comparison it is estimated that the plant will degrade to 68 percent of its initial output after two years in orbit. Author

N64-11086* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SATELLITE FERRIMAGNETIC POWER LIMITER
L. J. Varnerin, R. L. Comstock, W. A. Dean, and R. W. Kordos *In its* Telstar I, Vol. 3 Jun. 1963 p 1817-1827 refs (See N64-11079 02-01)

To limit the 4080-Mc local oscillator signal-power input to the beat oscillator (BO) modulator of the Telstar satellite communications repeater, a subsidiary absorption limiter was used which consisted of an optically polished sphere of single-crystal yttrium iron garnet (YIG), placed in a resonant transmission cavity between the amplified 4080-Mc output of the traveling-wave tube and the BO modulator input. The limiter holds the output power nearly constant above a given input threshold; below this threshold the YIG is linear and introduces only a small loss. The threshold is determined, for a given sample at a given frequency, by the external magnetic bias field. Temperature compensation over the desired range was obtained by orienting the crystal with the dc magnetic field along a [100] or "hard" axis. The total weight of the limiter package, including the bias magnet and cavity, is 13 ounces. Author

N64-11090 Bureau of Mines, Morgantown, W. Va. Morgantown Coal Research Center
FEASIBILITY OF ELECTRICAL PRECIPITATION AT HIGH TEMPERATURES AND PRESSURES
C. C. Shale, W. S. Bowie, J. H. Holden, and G. R. Strimbeck 1963 24 p refs

Electrical characteristics are presented for air in a 2-inch pipe-type electrostatic precipitator operating under dynamic conditions at temperatures of 600° to 1,500° F and pressures of 0 to 80 psig using a negative discharge electrode. Results of this one-geometry study show that current-voltage relationships are a function of air pressure and temperature and indicate that precipitators can be used at any temperature through about 1,350° F over the full range of pressure. Corona starting voltage and sparkover voltage vary directly with pressure and inversely with temperature. At temperatures above 1,350° F, use of precipitators may be limited to operations at pressures somewhat above atmospheric pressure. Theoretical derivations are presented that relate the effect of gas density on corona starting voltage and the effect of ion mobility on corona current. Author

N64-11099* Monsanto Research Corp., Everett, Mass. Boston, Labs.
DEVELOPMENT AND FEASIBILITY PROOF OF THE DRY TAPE BATTERY CONCEPT Quarterly Report No. 1, 14 June-30 Sept. 1963
Bernard A. Gruber, Alexander A. Borsanyi, Ralph Kafesjian, and John O. Smith 31 Oct. 1963 38 p
(NASA Contract NAS3-2777)
(NASA CR-52712; MRB5001Q1) OTS: $3.60 ph, $1.34 mf

Feasibility of the dry tape battery concept has been demonstrated on a laboratory test device with the Ag_2O_2/KOH/Zn system. Tapes coated with Ag_2O_2 have been discharged successfully, both alone (with separate electrolyte feed), and in a dual-tape system. The dual-tape system employs a separate prewet tape to feed KOH electrolyte and serve as separator. A stationary zinc block served as current collector and anode whereas silver plate or screen was used as a cathode current collector. Current densities as high as 1.6 amp/in^2 have been maintained, with a current efficiency of 75%, at a tape speed of one inch per minute. Output was 1.22 amps at 1.24 volts with energy densities from 25 to 108 whr/lb. Author

N64-11106* Thompson Ramo Woolridge Inc., Cleveland, Ohio New Product Research
BRAYTON CYCLE SOLAR COLLECTOR DESIGN STUDY PROGRAM, ITEM II. A. Monthly Progress Report No. 3, 1 Oct. 1963-31 Oct. 1963
12 Nov. 1963 22 p
(NASA Contract NAS3-2789; Proj. 512-004235-08)
(NASA CR-52861) OTS: $2.60 ph, $0.86 mf

Honeycomb sandwich material was shown to be a highly efficient structural concept, and analysis shows that thermal gradients in a continuous honeycomb shell will not produce excessive thermal distortions. Optical-performance-analysis approaches for parametric concentrator evaluations were finalized, and the resulting expressions are given. R.T.K.

N64-11108* Monsanto Research Corp., Everett, Mass. Boston Labs.
STUDY OF FUEL CELLS USING STORABLE ROCKET PROPELLANTS Quarterly Report No. 1, 28 June-28 Sept. 1963
J. O. Smith, R. E. Chute, R. G. Gentile, B. A. Gruber, and D. L. Kavanagh 25 Oct. 1963 84 p refs
(NASA Contract NAS3-2791)
(NASA CR-52860; MRB5002Q1) OTS: $8.10 ph, $2.72 mf

Storable rocket propellants such as hydrazine, MMH, UDMH and their mixtures, dinitrogen tetroxide (N_2O_4), nitric acid, and ClF_3 were studied for use in fuel cells. The electrochemical characteristics were derived from thermodynamic data and also determined experimentally to demonstrate the feasibility of using such reactants in a fuel cell. Preliminary results indicate the feasibility of a HNO_3–N_2H_4 cell and a N_2O_4–N_2H_4 cell. The analytical studies indicated that HNO_3 is reduced to NO and N_2 and N_2H_4 to N_2. MMH is oxidized to CH_3OH and N_2. The oxidation products of UDMH are still under study. The stability of catalyst and reactant was investigated both at open circuit and under load. Upper compatibility limits for N_2H_4/HF and ClF_3/HF were established. Solutions of these reactants in concentrations greater than 1 molar in anhydrous HF react violently. The Teflon/Kel-F half cell for running the polarization studies was completed. Author

N64-11120* Allis-Chalmers Mfg. Co., Milwaukee, Wis.
STUDY OF ENERGY CONVERSION SYSTEMS First Quarterly Report, 1 May 1963-31 Jul. 1963
R. Opperthauser, D. P. Ghere, and J. Euclide 30 Aug. 1963 37 p
(NASA Contract NAS8-5392)
(NASA CR-52652) OTS: $3.60 ph, $1.31 mf

A Static Moisture Removal System for the capillary hydrogen–oxygen fuel cell is described. Feasibility tests and breadboard tests of this system are discussed. In this system, a desired water vapor pressure is maintained in the cell through a water transport membrane associated with each cell. Water will not be evaporated from the cell electrolyte until the electrolyte vapor pressure exceeds the desired value. Above this value, evaporation rapidly increases. Author

N64-11140 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
APPLICATION OF THE THEORY OF SIMILARITY TO THE EXPERIMENTAL INVESTIGATION OF THE WORK REGIMES OF GAS TURBINES
G. E. Kalinin *In its* Heat Power Eng. 25 Jan. 1963 p 1-8 refs (See N64-11139 02-01)

An equation is derived that can be used in simulating work regimes of turbine engines on different working substances with differing values for the index of the adiabatic curve. R.T.K.

N64-11163 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
DEVICE FOR MULTIPOINT REGULATION
A. B. Simkin, A. Kazymov, et al 22 Jun. 1963 5 p Transl. into ENGLISH from Russian Patent No. 147043, (Appl. No. 673711/26), 19 Jul. 1960 p 1-3
(FTD-TT-63-431/1+2; AD-414991)

The proposed device is distinguished by the employment of two common controllable objects of relayless switches with mechanically switched nonsliding (pressure) contacts. Kinematic diagrams of the proposed device and one of the switches used are given. The device may find broad application for regulating various parameters in systems in which high control accuracy is required. R.T.K.

N64-11179 Gulton Industries, Inc., Metuchen, N.J.
SILVER-CADMIUM BATTERY PROGRAM [Final Report, 23 Jan. 1961-1 Oct. 1962]
G. Rampel, J. Liska, and R. C. Shair Wright-Patterson AFB, Ohio, Directorate of Aeromechanics, Mar. 1963 116 p
(Contract AF 33(600)-42397)
(WADD-TR-61-131, Pt. II; AD-402981)

A silver electrode was utilized which yielded up to 50% of its capacity at the Ag^{II} oxide voltage plateau, and the balance at the Ag^{I} oxide voltage plateau. Several separator systems were tested with regard to obtaining maximum cycle life. The best separator combination consisted of single layers of Dynel-Polypor WA (coarse nylon base)-Fibrous sausage casing-V, each enclosing the positive electrodes in the order listed. Sixty 7 ampere-hour cells, the AG-7HS, were life tested in a 90-minute cycle at several depths of discharge and at several temperatures, utilizing constant current and constant voltage recharge methods. Three thousand cycles were achieved at a 17% depth at 78° F. Charging problems are discussed. It was found that a charge routine consisting of a combination of constant current followed by constant potential was better than constant current charging or constant potential charging alone. Author

N64-11232* Electro-Optical Systems, Inc., Pasadena, Calif.
INVESTIGATION OF CONDENSERS APPLICABLE TO SPACE POWER SYSTEMS PART II: JET CONDENSERS

Lance Hays 30 Nov. 1962 218 p refs
(NASA Contract NAS7-11)
(NASA CR-52862; EOS-1588-Final-II) OTS: $14.50 ph, $6.74 mf

An investigation of condensers suitable for operation as components of space power systems operating on the Rankine cycle has been continued. Several geometric variations of jet condensers and direct (radiator) condensers were tested and analyzed. The test fluid was mercury, at temperatures ranging from 500° to 800° F. Vapor velocities ranged from less than 20 fps to greater than 250 fps. Results of jet condenser analysis and testing are reported herein. Author

N64-11275 Joint Publications Research Service, Washington, D.C.
SOME ASPECTS OF THE CURRENT STATUS OF THE FUEL CELL PROBLEM
O. K. Davtyan 5 Dec. 1963 14 p refs Transl. into ENGLISH of an article from Zhur. Fiz. Khim. (Moscow), v. 37, no. 9, Sep. 1963 p 1949–1957
(JPRS-22148; OTS-63-41299) OTS: $0.50

The following topics are discussed: (1) the electrochemical combustion of fuel, (2) the development of hydrogen–oxygen elements and batteries that function from room temperature to 300° and (3) the development of fuel elements using gaseous or liquid fuel, including carbon monoxide, methane, propane, etc., at temperatures higher than 300°. R.T.K.

N64-11297* Allis-Chalmers Mfg. Co., Milwaukee, Wis.
RESEARCH AND DEVELOPMENT OF AN OPEN-CYCLE FUEL CELL SYSTEM Fifth Quarterly Report, 1 Jul.-30 Sep. 1963
J. Euclide, R. Opperthauser, C. Pax, D. Ghere, and B. Nichols 31 Oct. 1963 34 p
(NASA Contract NAS8-2696)
(NASA CR-52545) OTS: $3.60 ph, $1.22 mf

This report summarizes thermal design considerations for a fuel cell system including thermal efficiency, thermal optimization of fuel cell plates, and various cooling systems. Operation of the Dynamic Vapor Pressure Control breadboard system, which was revised to include a liquid cell cooling system and to eliminate the oxygen recirculation system, is reported. Included is a discussion of various methods of fabricating fuel cell plates. Author

N64-11299* Marquardt Corp., Van Nuys, Calif.
STUDY OF BIOCHEMICAL FUEL CELLS Second Quarterly Progress Report, 1 Aug. 1963-31 Oct. 1963
George E. Ellis and Edward E. Sweeney [1963] 47 p
(NASA Contract NASw-654)
(NASA CR-52813; Rept. 25105) OTS: $4.60 ph, $1.61 mf

In conducting empirical studies on biochemical fuel cells for producing electrical energy through degradation of human waste, investigations were made of the electrolytic resistivities of all of the electrolytes and separators of the biofuel cells used in the study. Polarization and power curves obtained from the flowing system using feces-urine mixtures, and the supernatent liquid of a feces-urine mixture was obtained by centrifugation. The maximum peak anodic power density attained with the flowing system has been 1.3 milliwatts per square foot. Polarization and power curves were obtained from the nonflow system, using feces-urine mixtures in various ratios, either fresh or frozen, with indigenous or added microorganisms, and from vegetarian or omnivorous diets. The maximum peak anodic power density attained from the nonflow system was 4.0 milliwatts per square foot, and a total power density of 9.2 milliwatts per square foot. The anodic open-circuit potentials ranged from 0.462 to 0.719 v for the various fuel-anolyte mixtures. P.V.E.

N64-11323* Magna Corp., Anaheim, Calif. Research and Development Div.
RESEARCH ON APPLIED BIOELECTROCHEMISTRY Quarterly Progress Report No. 2, 1 Jul-30 Sep. 1963
James H. Canfield Oct. 1963 46 p refs
(NASA Contract NASw-623)
(NASA CR-52606; 339/7014/T6; 714-772-1261) OTS: $4.60 ph, $1.58 mf

Two methods have been used for calculating the theoretical electrochemical energy available from urine and feces used as fuels. The first, based upon heats of combustion, yields a maximum energy of 265 watt hours per man-day's output. The second, based upon converting urine nitrogen to ammonia, and feces polysaccharides to hydrogen, and using these as electrochemical fuels with oxygen, yields a maximum energy of 73.6 watt hours per man-day's output. Author

N64-11325 MSA-Research Corp., Callery, Pa.
ELECTROLYTIC PRODUCTION OF OXYGEN AND REDUCTION OF CARBON DIOXIDE Final Report
R. E. Shearer, C. A. Palladino, and J. C. King 4 Jun. 1963 38 p refs
(NASA Contract NASR-70)
(NASA CR-52878; MSAR 63-82) OTS: $3.60 ph, $1.34 mf

Work is reported on studies of the cathodic reduction of carbon dioxide with simultaneous anodic production of breathing oxygen from aqueous solutions. Studies included those of analytical procedures for possible organic products such as formic acid, formaldehyde, methanol, and methane. Details are given on the chemical and gas chromatographic procedures adopted for routine analysis. Details of studies of various parameters normally influencing cathodic reduction are given. Author

N64-11369 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group Research Dept.
SINGLE-AXIS GYROSCOPIC STABILIZATION SYSTEMS WHICH ARE INVARIANT RELATIVE TO EXTERNAL DISTURBANCES
Yu. M. Hovanskii Oct. 1963 12 p refs Transl. into ENGLISH of an article from Izv. Vysshikh Uchebn. Zavedenii Priborostr. (Leningrad), no. 4, 1963 p 90–97
(Transl. 472)

This is an example of the application of the Russian theory of invariance of automatic control systems. The theory of invariance states that if there are n disturbances entering linearly in systems, and if there are at least n scalar control variables, then the system can be made oblivious to these n disturbances. The application of the principle of invariance to the design of single-axis stabilization systems is reported. Author

N64-11382* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR CELL RADIATION DAMAGE STUDIES WITH 1 MEV ELECTRONS AND 4.6 MEV PROTONS
William R. Cherry and Luther W. Slifer 27 May 1963 42 p refs
(NASA TM X-51189; NASA X-636-63-110) OTS: $4.60 ph, $1.46 mf

The N/P and P/N silicon solar cells were compared. Results indicate: (1) the 1 ohm cm N/P silicon solar cell is more radiation resistant than the 1 ohm cm P/N cells to 1 Mev electrons and/or 4.6 Mev protons; (2) the 1 ohm cm N/P silicon solar cell is more radiation resistant to 4.6 Mev protons than cells made of low base resistivity material; and (3) as base resistivity of N/P cells is increased beyond 1 ohm cm, the radiation resistance to 1 Mev electrons definitely improves. R.T.K.

07 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy); chemical engineering; chemical properties of materials; and synthesis. *For related information see*: 18 Materials, Metallic; 19 Materials, Nonmetallic; and 26 Propellants and Combustion.

N64-10753 Joint Publications Research Service, Washington, D.C.

CERTAIN PROBLEMS IN THE CARBOTHERMIC REDUCTION OF NIOBIUM PENTOXIDE

P. V. Gel'd and G. P. Shveykin 22 Mar. 1963 14 p refs Transl. into ENGLISH of article from Izv. Akad. Nauk SSSR, Otd. Tekhn. Nauk, Met. i Topliov (Moscow), no. 1, 1959 p 44–49
(JPRS-18277; OTS-63-21384) OTS: $0.50

Kinetic studies were undertaken of the carbothermic reduction of niobium pentoxide. Nb_2O_5 preparations of various purity and origin were used. The kinetic studies at temperatures up to 1200° C were accomplished in a vacuum device equipped with a vertical quartz fire tube. An investigation of the direct reduction of the N_2O_5 compounds which were derived revealed that the kinetic characteristics of the process depend substantially upon the oxide's phase state—the most intensive reaction develops in the T-phase of N_2O_5. Results indicate that metallic niobium is obtained most advantageously by the use of an oxide–carbide mixture. R.T.K.

N64-10834 Joint Publications Research Service, Washington, D.C.

MECHANISM OF RADIATIONAL-CHEMICAL REACTIONS

S. Ya. Pshezhetskiy 26 Jun. 1963 121 p refs Transl. into ENGLISH from the book "Mekhanizm Radiatsionno-Khimicheskikh Reaktsiy", Moscow, 1962 p 195-276 and 311-350
(JPRS-19876; OTS-63-31125) OTS: $2.50

The study of radiational conversion of hydrocarbons included paraffins, unsaturated hydrocarbons, and aromatic hydrocarbons. This included the processes of energy and charge transfer in the radiolysis of hydrocarbons, and the effect of radiation parameters on radiolysis of hydrocarbons. In dealing with radiational conversion of several organic compounds, alkyl halides, alcohols, acids, esters, and high molecular weight polymers were among the compounds studied. In the study of radiational–chemical reactions in condensed phases, effects caused by particle tracks are considered, along with features of radiational–chemical processes in the liquid phase, in the solid state, at low temperatures, and radiational-catalytic processes and heterogeneous sensitization. C.L.W.

N64-10865 Atlantic Research Corp., Alexandria, Va.

IMPROVEMENT OF THE USEFULNESS OF PYROLYTIC GRAPHITE IN ROCKET MOTOR APPLICATIONS Final Technical Summary Report [June 1, 1960–Dec. 31, 1962]

James D. Batchelor, Edwin F. Ford, and Eugene L. Olcott Feb. 1963 104 p
(Contract DA-36-034-ORD-3279 Z)
(AD-401115)

The effect of the deposition process conditions on the nature of the pyrolytic graphite coating formed was investigated. The pyrolytic graphite was characterized by density measurements, X-ray diffraction analysis, and microstructure examination. The deposition process was found sensitive to carbonaceous source gas concentration and local gas flow conditions with a lesser effect of temperature above about 1900° C. Below about 1900° C the deposits became increasingly coarse with decreased temperature. The basic stress–strain relationships were derived for an anisotropic material such as pyrolytic graphite. Experimental measurement in subscale rocket nozzle tests was carried out to find the inherent erosion rate of a standard (2000° C) pyrolytic graphite under a variety of motor operating conditions. For a given propellant the erosion rate was a function of the motor operating pressure. Over the range studied, propellant flame temperature was found more significant than oxidation ratio in determining the erosion rate. The performance of pyrolytic graphite coatings was excellent in all propellants at all motor pressures. Author

N64-10898 California Research Corp., Richmond

RADIATION EFFECTS ON ORGANIC MATERIALS

Robert O. Bolt and James G. Carroll, eds. New York, Academic Press, 1963 589 p refs
(Sponsored by AEC)

Nuclear radiation and its effects on the properties of organic liquids, solids, and gases are discussed in this book. The interactions of radiation with matter, the mechanisms of chemical effects of ionizing radiation, and the radiation chemistry of pure compounds are considered first. Then, the effects of radiation on polymers, plastics, elastomeric materials, coolants, lubricants, adhesives, textiles, coatings and films, dielectric fluids, fuels and fluid shield materials, and coal, wood, and explosives are discussed. Finally, the potential benefits of radiation, including radiation processing of materials, are presented. Correlation is simplified by the consistent use of the rad as the basic radiation unit throughout the book. M.P.G.

N64-10906* Pennsylvania U., Philadelphia Electrochemistry Lab.

STUDIES OF THE FUNDAMENTAL CHEMISTRY PROPERTIES AND BEHAVIOR OF FUEL CELLS Second Semi-annual Progress Report, 1 Apr.–30 Sep. 1963

J. O'M. Bockris [1963] 64 p refs
(NASA Grant NsG-325)
(NASA CR-52710) OTS: $6.60 ph, $2.12 mf

Progress is reported on: (1) determination of the potential of zero charge on a series of solid metals; (2) deactivation of electrodes—adsorption; (3) the nature of catalysts; (4) the mechanism of electro-catalysis; (5) studies of the mechanism of porous electrodes; and (6) the theory of electric double layers. J.E.T.

N64-10991 Canadian Armament Research and Development Establishment, Valcartier

METHODS OF CHEMICAL ANALYSIS OF CARDEPLEX PROPELLANT No. 4760/A5 AND ITS INGREDIENTS

R. Mac Donald and A. M. Bedard Mar. 1963 36 p
(CARDE TR-426/63)

This report describes the methods currently used to control the manufacture of ammonium perchlorate-polyurethane propellant. Most of these methods are concerned with propellant formulation No. 4760/A5. The analysis of starting materials is given. Control analyses of premixed ingredients are described, and the analysis of partially cured and fully cured propellant is given. Author

N64-11117* Houston U., Tex.
SYNTHESIS OF ORGANIC COMPOUNDS BY HIGH-ENERGY ELECTRONS
J. Oro (Calif. U.) Repr. from Nature, v. 197, no. 4871, 9 Mar. 1963 p 971–974 refs
(NASA Grant 257-62)

The results of experiments on the effects of ionizing radiation on the compounds, ^{14}C-methane, ammonia, and water, have been compared with similar experiments, using electrical discharges, in an attempt to discover the means of formation of the first organic molecules on the primitive earth. It is found that: (1) organic compounds are formed by the action of high-energy electron radiation on methane, ammonia, and water in both the solid phase and the gas phase; (2) the autoradiographic patterns of compounds so formed are similar to those obtained by electric discharges, but the products of solid-phase irradiation are less polar; and (3) since the compounds of carbon, nitrogen, and oxygen, especially the hydrides, are important in the universe, it is suggested that the radiation synthesis of organic and biochemical compounds is an important cosmic process. D.E.R.

N64-11152 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
REFINING HIGHLY UNSATURATED SULFUROUS DISTILLATES OF THE CRACKING PROCESS
V. G. Plyusin, D. F. Vorfalomeyev, and A. P. Lysenko 27 Aug. 1963 16 p refs Transl. into ENGLISH from the book "Sbornik Rabot Laboratorii Neftesinteza", Akad. Nauk SSSR, Ural'skiy Filial, Tr. Inst. Khim., Sverdlovsk, no. 4, 1960 p 85–94
(FTD-TT-63-782/1+2; AD-420863)

A method for obtaining a nonsulfurous stable fuel from highly unsaturated sulfurous distillates, using intense thermal treatment of mazuts and heavy residues, by means of hydrodehydropolymerization and desulfurization in the presence of hydrogen fluoride, is discussed. In processing the distillates with hydrogen fluoride, the dehydropolymers and sulfurous compounds form a complex with it, and in this way are separated from the hydropolymers. The output of hydropolymers, depending on the content of unsaturated compounds in the raw material, fluctuates from 80% to 93%. Dehydropolymers, which form complexes with the catalyst, are easily separated from the hydrogen fluoride through heating. Dehydropolymers represent olefins with two or three double combinations, possess the properties of siccative oils, and can be used as artificial drying oils. P.V.E.

N64-11153 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THE SENSITIVITY OF OZONE-OXYGEN SOLUTIONS TO A PRESSURE PULSE
Z. B. Basyrov and A. V. Pankratov 26 Dec. 1962 8 p refs Transl. into ENGLISH from Khim. Prom., no. 3, 1962 p 22–23
(FTD-TT-62-1460/1+2+4; AD-295454)

The results obtained indicate that ozone–oxygen solutions possess a very high sensitivity to pressure pulses. The dilution of liquid ozone with oxygen leads to a sharp decrease in the pressure pulse necessary to excite an explosion in the solution. This dependence is expressed by the relationship $P_{ref} = 173e^{-0.0382C}$, where P_{ref} is the pressure caused by the reflection of the shock wave from the bottom of the test vessel, and C is the ozone content. A direct connection was noted between the sensitivity of the ozone–oxygen mixtures to pressure pulses, and the minimum self-ignition point of ozone in a gaseous oxygen atmosphere. P.V.E.

N64-11156 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
FUEL CHEMISTRY
N. M. Nazarova et al 20 Dec. 1962 31 p refs Transl. into ENGLISH of selected articles from Neftekhimiya, v. 1, no. 5, 1961 p 613–623, 669–674 refs
(FTD-TT-62-1185/1+2+4; AD-294503)

CONTENTS:

1. THERMAL ALKYLATION OF METHYLCYCLOHEXANE WITH OLEFINS UNDER PRESSURE N. M. Nazarova, L. Kh. Freydlin, R. N. Shafran, and E. F. Litvin p 1–11 refs (See N64-11157 02-07)
2. ALKYLATING TETRAHYDRONAPHTHALENE BY OLEFINS IN THE ALIPHATIC RING L. Kh. Freydlin and N. M. Nazarova p 12–19 refs (See N64-11158 02-07)
3. OXIDATION OF HYDROCARBONS WITH A HIGH DEGREE OF CONVERSION L. K. Obukhova et al p 20–29 refs (See N64-11159 02-07)

N64-11157 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THERMAL ALKYLATION OF METHYLCYCLOHEXANE WITH OFEFINS UNDER PRESSURE
N. M. Nazarova, L. Kh. Freydln, R. N. Shafran, and E. F. Litvin *In its* Fuel Chem. 20 Dec. 1962 p 1–11 refs (See N64-11156 02-07)

Results of the research on temperature and pressure influences on the course of alkylation of methylcyclohexane with ethylene are given. In thermal condition, methylcyclohexane was alkylated more easily by olefins than was unsubstituted cyclohexane. Results indicate that the basic reaction product is methylethylcyclohexane, a mixture of 1,3- and 1,4-isomers forming in ratios different from the equilibrium ones for those isomers. R.T.K.

N64-11158 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ALKYLATING TETRAHYDRONAPHTHALENE BY OLEFINS IN THE ALIPHATIC RING
L. Kh. Freydlin and N. M. Nazarova *In its* Fuel Chem. 20 Dec. 1962 p 12–19 refs (See N64-11156 02-07)

After passing through quartz (at 450° C and 200 atm), tetralin was found to be alkylated by ethylene and propylene. Results of the study of the alkylation of tetralin by ethylene and propylene indicate: (1) under thermal conditions tetralin is selectively alkylated by ethylene in the aliphatic ring, (2) the basic reaction product with ethylene is 1-ethyltetralin, and (3) alkylation with propylene proceeds with greater difficulty than with ethylene. R.T.K.

N64-11159 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
OXIDATION OF HYDROCARBONS WITH A HIGH DEGREE OF CONVERSION
L. K. Obukhova et al *In its* Fuel Chem. 20 Dec. 1962 p 20–29 refs (See N64-11156 02-07)

N-decane was investigated; oxidation was produced by bubbling-through of oxygen. Removal of water and part of the volatile acids from the reaction zone was found to favor the decane oxidation at high rates, until the consumption of the hydrocarbon was almost complete. The kinetics of the basic reaction product were autocatalytic; the effective activation energy of the n-decane oxidation was found to be 28 kcal. R.T.K.

N64-11164 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

ISOLATION OF METHYLCYCLOPENTANE AND CYCLOHEXANE FROM PETROLEUM FRACTIONS

Ye. M. Benashvili 14 Aug. 1963 9 p refs Transl. into ENGLISH from Neftekhimiya, v. 2, no. 2, 1962 p 160–163
(FTD-TT-63-563/1+2+4; AD-414982)

An investigation was made of the optimum conditions for obtaining methylcyclopentane from petroleum. Comparative data are presented on the isolation of cyclohexane and methylcyclopentane from narrow petroleum fractions. R.T.K.

N64-11174 Naval Ordnance Lab., White Oak, Md.

POLISHES AND ETCHES FOR TIN TELLURIDE, LEAD SULFIDE, LEAD SELENIDE, AND LEAD TELLURIDE

Marriner K. Norr Nov. 1963 37 p refs
(NOLTR-63-156; AD-423367)

A review is given of chemical and electrolytic polishes and dislocation etches for SnTe, PbS, PbSe, and PbTe, covering the period from 1907 to 1962. Recipes, conditions, and results are described. Satisfactory polishes for all compounds except PbS, and etches for all except SnTe are included. Author

N64-11176 Naval Research Lab., Washington, D.C.

SURFACE ACTIVITY OF FLUORINATED ORGANIC COMPOUNDS AT ORGANIC-LIQUID/AIR INTERFACES. PART V – THE EFFECT OF PARTIALLY FLUORINATED ADDITIVES ON THE WETTABILITY OF SOLID POLYMERS

N. L. Jarvis, W. A. Zisman, R. B. Fox, and L. G. Isaacs 9 Aug. 1963 15 p refs
(NRL-5952; AD-420880)

It was found that certain fluorocarbon derivatives would adsorb at polymer–air interfaces when added directly to the monomer before polymerization or when placed in a solution of the polymer, in which case the polymer surface was formed by the slow evaporation of the solvent. As expected, the amount of adsorption in either case was found to be dependent upon the organophilic–organophobic balance in the solute, which depends upon its fluorine content, molecular structure, and solubility in the bulk polymer phase. The surface activity of the fluorinated compounds at each polymer–air interface was determined from the changes in wettability of the smooth, solid polymer surfaces brought about by their adsorption. It was demonstrated that additives developed previously to be surface active in organic liquids markedly decreased the critical surface tension of wetting (γ_c) of polymer surfaces. Author

N64-11284 Union Carbide Nuclear Co., Oak Ridge, Tenn. Y-12 Plant

DETERMINATION OF CHLORIDE IN BERYLLIUM METAL BY X-RAY FLUORESCENCE

J. H. Keys and J. H. Rowan 21 Nov. 1963 16 p refs
(Contract W-7405-eng-26)
(Y-1447)

X-ray fluorescent analysis has been applied to the determination of microgram quantities of chloride in beryllium metal powder. This application is preferable to wet-chemistry applications because of the speed and simplicity of analysis. Evaluation of the method consisted of pipetting a standard chloride solution on beryllium metal powder, drying, pressing into pellets, and analyzing. Analysis of standards containing from 250 to 2000 μg of chloride per gram of beryllium gave an absolute limit of error (0.95) of ±54 μg. At the mean level of 865 μg, the percent limit of error was ±6.2%. Author

N64-11289 Mallinckrodt Chemical Works, Weldon Spring, Mo. Uranium Div.

INFRARED ABSORPTION ANALYSIS OF URANYL FLUORIDE IN URANIUM (IV) FLUORIDE. (QUANTITATIVE DETERMINATION IN THE SOLID PHASE)

H. E. Pena 2 Dec. 1963 16 p refs
(Contract W-14-108-eng-8)
(MCW-1468) OTS: $0.50

The integrated absorption intensity of the uranyl ion in uranium(IV) fluoride was measured from recorded spectra. The potassium bromide sample preparation technique was used. A comparison was made between the values obtained by this method and those obtained by the exhaustive extraction of uranyl fluoride. The most favorable condition for the total extraction of uranyl fluoride from uranium(IV) fluoride is by the use of absolute methanol as a solvent. The infrared method shows that the total uranium(VI) content in production-grade uranium(IV) fluoride exists in part as an alcohol-soluble uranyl ion and in part as an alcohol-insoluble uranium (VI) compound. Author

N64-11290 Los Alamos Scientific Lab., N. Mex.

A METHOD FOR THE USE OF CATION EXCHANGE RESINS TO DETERMINE ASSOCIATION CONSTANTS OF CEROUS AND SULFATE IONS

L. A. Blatz 14 Nov. 1963 30 p refs
(Contract W-7405-eng-36)
(LA-2513) OTS: $0.75

The use of cation exchange resins for studying ionic equilibria in aqueous solutions of sulfate and plus-three metal ions is considered. The method and equations are developed for the system cerous and sulfate ions. More than one complex, exchange of the first complex with the resin, three methods of extrapolation to zero sulfate ion concentration at constant and varying ionic strengths, and some factors affecting precision under each of these headings are considered. Some previous work on this system is reviewed. Author

N64-11308 Deutsche Versuchsanstalt für Luft- Und Raumfahrt, Munich (W. Germany) Inst. für Flugtreib Und Schmierstoffe

DEVELOPMENT OF A DESIGN FOR THE AGEING OF AIRPLANE ENGINE OILS AT HIGH TEMPERATURES [ENTWICKLUNG EINER ANLAGE ZUR ALTERUNG VON FLUGMOTORENOLEN BEI HOHEN TEMPERATUREN]

G. Spengler and E. K. Jantzen Sep. 1963 45 p refs In GERMAN
(DVL-287) Available from Vereinigte Universitäts—U. Fachbuchhandlungen, R.-Wagner-Str. 1, Cologne, W. Germany

The importance of aging lubricating oil and the essential aging processes are discussed. In addition, a unit for aging aircraft engine oil at high temperatures is described; this unit permits the aging of oil up to 450° C over arbitrary time periods. During the aging process, gases such as air and nitrogen can be fed into the oil. Low-temperature condensers collect by-products of aging. Some examples of aged oils are discussed which give an insight as to the thermal- and thermal oxidation-aging processes. The unit described above permits the aging of oils at temperatures which will arise in future aircraft, and thereby establishes the premise for the investigation of the aging process in aircraft engine oils. Trans. by I.v.L.

N64-11322 Atomics International, Canoga Park, Calif.

REPROCESSING OF URANIUM CARBIDE BY A NITRIDE-CARBIDE CYCLE. 1. KINETICS OF NITRIDE FORMATION

L. A. Hanson 31 Oct. 1963 39 p refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-8388) OTS: $0.75

The reaction rate of aged UC is higher by a factor of 28 over freshly melted UC. The reaction rate varies: (1) with UC particle size, having a maximum rate for −400 mesh powder, and a minimum for the 100 to 200 mesh size fraction; (2) with uranium carbide composition, and is a minimum for slightly hypostoichiometric UC; (3) as the 3/4 power of the nitrogen pressure. The reaction rate is postulated as being controlled by the formation of the U_2N_3 phase below 650° C; whereas, above 650° C, the observed reaction rate is a combination of a primary process, U_2N_3 formation, and a secondary inhibiting effect probably caused by the decomposition of the U_2N_3 phase. Activation energies of 31.8 ±1.3 kcal/mole for the primary reaction and 37.4 ±2.2 kcal/mole for the secondary reaction were determined. Oxidation of the nitride in air at room temperature was noted. Author

N64-11347 Joint Publications Research Service, Washington, D.C.
PREPARATION OF CERIUM NITRIDE, USSR
G. V. Samsonov and M. D. Lyutaya 26 Apr. 1963 8 p refs Transl. into ENGLISH of an article in Zh. Prikl. Khim. (Leningrad), v. 35, no. 11, Nov. 1962 p 2359–2362
(JPRS-18919; OTS-63-21689) OTS: $0.50

Cerium nitride, CeN, has been prepared by placing the metal in an argon or carbon dioxide atmosphere in quartz and injecting a stream of nitrogen or ammonia gas into the quartz reactor. The reactor was then heated in a shaft furnance. Nitridation is obtained at 500° C with ammonia and at 800° C with nitrogen. It has been established that when cerium is nitrided with nitrogen, a gas-impermeable nitride film is formed on the metal surface, which is not broken down until melting. When nitriding with ammonia, cerium hydride is first formed, breaking down the metal, and preventing the formation of nitride films, which guarantees the active nitridation at low temperatures. The products were subjected to X-ray analysis, revealing the presence of cubic phase with a period a = 5.023A. D.E.R.

N64-11381* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CORROSION PROBLEMS ASSOCIATED WITH THE USE OF TITANIUM FASTENERS TO CONNECT ALUMINUM COMPONENTS
E. E. Nelson and J. G. Williamson 30 Sep. 1963 17 p
(NASA TM X-51167; MTP-P&VE-M-63-13) OTS: $1.60 ph, $0.80 mf

Corrosion studies have indicated that Ti-6A1-4V alloy fasteners can be used to connect aluminum components without significant corrosion on the aluminum component in a normal atmospheric environment. However, exacting installation procedures must be followed for adequate control of galvanic corrosion. Author

N64-11410 Battelle Memorial Inst., Columbus, Ohio
RADIATION-INDUCED FORMATION OF ORGANOTIN COMPOUNDS Topical Report
Robert E. Wyant, James L. Mc Farling, John F. Kircher, and E. Jack Kahler 1 Nov. 1963 15 p refs
(Contract W-7405-eng-92)
(BMI-1654) OTS: $0.50

Particle size of tin, ambient atmosphere, chemical structure of halide, irradiation temperature, pretreatment of tin, and additives were employed as variables in a study of the nature of the reaction between organic bromides and powdered tin in a radiation field. Temperature and tin pretreatment appeared to affect the yield to the greatest extent. Among the butyl bromide isomers the reactivity followed the order tertiary > secondary > primary. Under the best conditions found in these limited studies, i.e., temperature at 90° C and addition of hydrobromic acid to the halide, a G-value of ~ 600 was obtained using 1-bromobutane. Author

N64-11437 Iowa State U. of Science and Tech., Ames Ames Lab.
COUNTER CURRENT EXTRACTION IN SALT/METAL SYSTEMS INVOLVING OXIDATION-REDUCTION REACTIONS
P. Chiotti Jun. 1963 25 p refs
(Contract W-7405-eng-82)
(IS-660)

The separation of solutes by counter-current techniques in a two-phase system, in which the transfer of solutes between the two phases depends on an oxidation-reduction reaction of fixed stoichiometry, is shown to be analogous to the separation of components in a distillation column. A flow diagram for separating two solutes, such as uranium and thorium, in a KCl–LiCl/zinc system is presented. Mathematical relations and graphical methods for determining the number of equilibrium stages required to effect a given separation are developed. The number of precipitate phases in the solvent streams must be limited for the counter-current system to be operative. Author

08 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; telemetry; tracking; and wave propogation. *For tracking stations see*: 10 Facilities, Research and Support. *For related information see*: 06 Auxiliary Systems; 09 Electronics; 15 Instrumentation and Photography; and 22 Navigation and Guidance.

N64-10719 Joint Publications Research Service, Washington, D.C.
SOVIET SATELLITE TRACKING EQUIPMENT
V. M. Tiyt et al 21 Feb. 1963 16 p Transl. into ENGLISH from Byul. St. Optich. Nablyudeniya Iskusstv. Sputnikov Zemli (USSR), no. 5, 1960 p 1–9
(JPRS-17775; OTS-63-21190) OTS: $0.50

CONTENTS:

1. A NEW SATELLITE TRACKING INSTRUMENT, LUN-3 V. M. Tiyt p 1–8 (See N64-10720 02-08)
2. SEMIAUTOMATIC TELESCOPE FOR SATELLITE TRACKING Ya. E. Einasto p 9–13 (See N64-10721 02-08)

N64-10720 Joint Publications Research Service, Washington, D.C.
A NEW SATELLITE TRACKING INSTRUMENT, LUN-3
V. M. Tiyt (Acad. of Sci., Eston. SSR) *In its* Sov. Satellite Tracking Equipment 21 Feb. 1963 p 1–8 Transl. into ENGLISH from Byul St. Optich. Nablyudeniya Iskusstv. Sputnikov Zemli (USSR), no. 5, 1960 p 1–6 (See N64-10719 02-08)

LUN-3 consists of an E-L type clock (drive) mechanism, a refractor with guides, a control panel, and accessory equipment connecting the separate units to a servo system. Synchros are used as sensing elements in the servo system in the LUN-3. Synchro-transmitters and synchro-receivers are coupled to each other through differential synchros in a transformer mode. Differential synchros are located in the control panel which is located near the telescope. The clock mechanism, power supply unit, amplifiers, and clocks are housed in heated quarters. P.V.E.

N64-10721 Joint Publications Research Service, Washington, D.C.
SEMIAUTOMATIC TELESCOPE FOR SATELLITE TRACKING
Ya. E. Einasto (Acad. of Sci., Eston. SSR) *In its* Sov. Satellite Tracking Equipment 21 Feb. 1963 p 9–13 Transl. into ENGLISH from Byul. St. Optich. Nablyudeniya Iskusstv. Sputnikov Zemli (USSR), no. 5, 1960 p 6–9 (See N64-10719 02-08)

A telescope is described which accomplishes approximate tracking of a satellite, while precise guidance is done manually by the observer. The instrument is mounted on a nonfixed polar axis which permits the use of orbital coordinates during the tracking of artificial earth satellites. The instrument mounting has 4 axes: vertical and horizontal axes serve for directing the polar axis of the instrument in the field of the satellite orbit; the two remaining axes (polar and latitude) function in the same way as the polar and declination axes of ordinary astronomical telescopes. P.V.E.

N64-10812 Joint Publications Research Service, Washington, D.C.
COMPUTING MAXIMUM USABLE FREQUENCIES OF RADIO COMMUNICATION LINKS
V. N. Navysh-Bylinskaya 30 Apr. 1963 25 p refs Transl. into ENGLISH from Tr. Inst. Zemnogo Magnetizma, Ionosferii i Rasprostraneniya Radiovoln Akad. Nauk SSSR (Moscow), no. 19 (29), 1961 p 71–84
(JPRS-18997; OTS-63-21726) OTS: $0.75

This study was undertaken to compare the accuracy of two different methods of computation of the maximum usable frequency for shortwave radio communication links in order to find out the most satisfactory method to be used in published radio forecasts. These are the method of "reference points" and the method of "equal jumps." The examination of these two methods was done by comparing the calculated values of maximum usable frequency with the actual values observed on several radio communication links. Author

N64-10839 Joint Publications Research Service, Washington, D.C.
ESTIMATION OF ACCURACY OF RELATING THE MOMENT OF OBSERVATION TO THE PRECISE-TIME SIGNALS
M. I. Illenko (Acad. Sci. USSR) *In its* Accuracy Problems in the Observation of Artificial Earth Satellites 11 Jul. 1963 2 p Transl. into ENGLISH from Byul. St. Optich. Nablyudeniya Iskusstv. Sputnikov Zemli (USSR), no. 25, 1962 p 5-6 (See N64-10838 02-01)

Experiments were performed to determine the magnitude of error in relating the moment of observations of artificial earth satellites to the precise-time signals received. The precise-time signals and the pulse signals of a standard quartz clock were recorded simultaneously on a recording chronograph and compared. A discussion of technique and results is included. J.E.T.

N64-10879* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMMAND AND TELEMETRY SYSTEMS
R. C. Chapman, Jr., G. F. Critchlow, and H. Mann *In its* Telstar I, Vol. 1 Jun. 1963 p 1027–1062 refs (See N64-10868 02-01)

The command and telemetry portions of the Telstar system provide necessary support functions for the basic communications experiment and the radiation experiment. By means of the command system, the states of 9 magnetic latching relays in the satellite are controlled from the ground. Commands are sent to the satellite by coded signals modulated on a carrier in the VHF band. The telemetry system also uses a VHF carrier to transmit encoded information from the satellite. Data on 112 items are provided once each minute. This paper discusses the overall command and telemetry systems and considers the general objectives, system aspects, and detailed implementation. Author

N64-10881* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE FM DEMODULATOR WITH NEGATIVE FEEDBACK
A. J. Giger and J. G. Chaffee *In its* Telstar I, Vol. 1 Jun. 1963 p 1109–1135 refs (See N64-10868 02-01)

This paper describes the design and theory of operation of the wideband FM demodulator with feedback (FMFB receiver) used at the Andover, Maine, earth station for Telstar satellite communications tests. Performance data for the FMFB receiver indicate a clear advantage over the conventional FM receiver in many cases. The principal advantage lies in the ability of the FMFB receiver to raise the threshold at which "breaking" occurs for TV and other wideband signals. Author

N64-10883* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MECHANICAL DESIGN OF THE HORN-REFLECTOR ANTENNA AND RADOME
J. C. Dolling, R. W. Blackmore, W. J. Kindermann, and K. B. Woodard *In its* Telstar I, Vol. 2 Jun. 1963 p 1137–1186 refs (See N64-10882 02-01)

This paper describes the mechanical design of the horn-reflector antenna and the associated radome. The mechanical considerations dictating the final configuration of the antenna structure are discussed, along with the engineering aspects of the design, fabrication, and erection of the structure. The mechanical features of the data takeoff and antenna drive systems are given in detail. The final section presents an account of the requirements, manufacture, and installation of the radome and its accessory equipment. Author

N64-10884* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ELECTRICAL CHARACTERISTICS OF THE CONICAL HORN-REFLECTOR ANTENNA
J. N. Hines, Tingye Li, and R. H. Turrin *In its* Telstar I, Vol. 2, Jun. 1963 p 1187–1211 refs (See N64-10882 02-01)

The conical horn-reflector antenna was selected for the satellite communication ground station because of its broadband and low-noise properties. Prior to the construction of the full-size antenna, theoretical and model studies of its electrical characteristics were undertaken. These studies consisted of computing gain and radiation patterns for two modes of excitation, construction of model antennas and their measurement. Results of these studies are presented together with results of the measurements of the full size antenna at Andover, Maine. Author

N64-10885* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANTENNA POINTING SYSTEM: ORGANIZATION AND PERFORMANCE

J. A. Githens, H. P. Kelly, J. C. Lozier, and A. A. Lundstrom *In its* Telstar I, Vol. 2, Jun. 1963 p 1213–1221 refs (See N64-10882 02-01)

This paper is a description of the antenna pointing system used in the satellite ground station at Andover, Maine. In order that the antenna have sufficient gain for the Telstar experiment, it was necessary that it have a "pencil" beam of about 1/5 degree in diameter. This required an antenna pointing system of high accuracy. The equipment and methods required to achieve this accuracy are outlined. Author

N64-10886* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIGITAL EQUIPMENT FOR THE ANTENNA POINTING SYSTEM
J. A. Githens and T. R. Peters *In its* Telstar I, Vol. 2, Jun. 1963 p 1223–1252 refs (See N64-10882 02-01)

This paper describes the digital control and data-processing portions of the antenna pointing system used to track the Telstar satellite. The description is functional in nature, giving the form of the inputs, the functions performed, and the outputs produced. A general description of the digital equipment is followed by a discussion of the functions performed by the subsystems, the operational modes provided, the equipment features, and the operating experience. Author

N64-10887* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SERVO SYSTEM FOR ANTENNA POSITIONING
J. C. Lozier, J. A. Norton, and M. Iwama *In its* Telstar I, Vol. 2, Jun. 1963 p 1253–1281 refs (See N64-10882 02-01)

This paper describes the servosystem for pointing the horn-reflector antenna. It presents the general considerations which dictated the design and also describes the resulting system in some detail, giving the characteristics of the various parts of the system. Finally, the overall performance of the servosystem is discussed. Author

N64-10888* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE AUTOTRACK SYSTEM
J. S. Cook and R. Lowell *In its* Telstar I, Vol. 2, Jun. 1963 p 1283–1307 refs (See N64-10882 02-01)

The autotrack system accurately senses the direction of arrival, at the horn-reflector antenna, of the microwave beacon signal from the communications satellite. When this direction does not coincide with the horn-reflector pointing direction, error correcting voltages are automatically generated to enable the antenna direction system to steer the antenna toward the satellite. This paper presents a simple analysis of error voltage generation, a description of the system, and a brief discussion of system performance. Author

N64-10889* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE PRECISION TRACKER
J. V. Anders, E. F. Higgins, Jr., J. L. Murray, and F. J. Schaefer, Jr. *In its* Telstar I, Vol. 2, Jun. 1963 p 1309–1356 refs (See N64-10882 02-01)

The precision tracker—a simultaneous lobing, amplitude comparison, passive, continuous-wave tracker based in principle and design upon a monopulse tracking radar—is employed at the Andover, Maine, and Pleumeur-Bodou, France, stations to find the satellite and direct the horn-reflector antennas when required. At regular intervals during subsequent passes, it provides the precise tracking data required for prediction of future orbital parameters. Author

N64-10896* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESULTS OF THE TELSTAR SYSTEM COMMUNICATIONS TESTS
R. W. Hatch, S. B. Bennett, and J. P. Kinzer *In its* Telstar I, Vol. 2, Jun. 1963 p 1561–1629 refs (See N64-10882 02-01)

The results of the communications tests on the Telstar satellite system which have been conducted at the Andover earth station are presented. These tests have included successful transmissions of telephone, television, and data signals. In addition, measurements of received carrier power, noise, transmission characteristics, linearity, data system errors, absolute delay, and Doppler shift have been made. The results are in good agreement with the expected performance. Author

N64-10897* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE COMMAND SYSTEM MALFUNCTION OF THE TELSTAR SATELLITE
J. S. Mayo, H. Mann, F. J. Witt, D. S. Peck, H. K. Gummel, and W. L. Brown *In its* Telstar I, Vol. 2, Jun. 1963 p 1631–1657 refs (See N64-10882 02-01)

Facts are presented which led to the conclusion that the malfunction of the command system was due to surface damage to certain transistors in the redundant command decoders by the enhanced radiation in the inner Van Allen belt. Correction steps have included laboratory experiments to gain a better understanding of the cause of failure, the use of continuous normal commands, commands transmitted from Johannesburg, South Africa, and specially modified commands to circumvent failure of the more vulnerable transistors. The operations which aided in the gradual rejuvenation of both command decoders are described. Also covered are the subsequent reappearance of the command system malfunction, at a later date, and its correlation with the variation of the average radiation intensity seen by the satellite. Author

N64-11002 Joint Publications Research Service, Washington, D.C.
THE SCATTERING OF ELECTROMAGNETIC WAVES ON UNEVEN SURFACES
V. I. Mykhaylov *In its* Electromagnetic Wave Scattering and Super-High Vacuum Via Semiconductors 8 Feb. 1963 p 1–8 refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 7, no. 12, Dec. 1962 p 1274–1279 Presented at the 2d All-Union Symp. on Wave Diffraction, June 1962 (See N64-11001 02-01) OTS: $0.50

Study was devoted to the calculation of the mean values of the electromagnetic field and intensity of scattered radiation. Formulas are obtained for the mean values of the field and intensity suitable in the Fraunhofer zone for all angles of scattering permissible within the limits of the Kirchoff approximation. The formulas for the mean field are suitable also in the near zone within limits of inequality.

In the direction of mirror reflection, the formulas for the field concur with the well-known results of Antokolsiy, and the expressions for intensity agree with formulas of Isakovich. C.L.W.

N64-11057 Joint Publications Research Service, Washington, D.C.
THE STRUCTURE OF FUNCTIONS WITH A LIMITED SPECTRUM AND RELATED PROBLEMS IN COMMUNICATIONS THEORY
B. S. Tsybakov and V. P. Yakovlev 3 Apr. 1963 19 p refs
Transl. into ENGLISH of an article from Mosk. Fiz.-Tekh. Inst., Issled. Po Fiz. i Radiotekhn., Tr. Inst. (Moscow), no. 2, 1958 p 13-29
(JPRS-18510; OTS-63-21485) OTS: $0.50

The representation of limited spectrum functions in terms of their values, and the value of their derivatives defined over some periodic sequence of arguments are dealt with. First, consideration is given to the meaning of representation of a limited spectrum as a Kotel'nikov series. The nature of a limited spectrum function is revealed, and the problem of defining the function in a region in terms of its values at separate points is reduced to the problem of whole function interpolation. The relationship between limited spectrum functions and whole functions was determined, and attention was given to the solution of the interpolation problem for the whole function. After solving the problem, an expansion in the form of a Kotel'nikov series was sought. The problem of the single valued restoration of the function upon expansion of interval delta x and constant spectral width was also considered. C.L.W.

N64-11138 Joint Publications Research Service, Washington, D.C.
THE POWER OF INVISIBLE WAVES
V. Borisov 5 Nov. 1963 11 p Transl. into ENGLISH of an article from Znaniye-Sila(Moscow), no. 8, 1963 p 19-21
(JPRS-21726; OTS-63-41062) OTS: $0.50

The magnetron and planotron make possible the efficient production of a high-power magnetic field. High-frequency electrical oscillations can be transmitted through waveguides—metal pipes of rectangular and circular cross section. Heating with the aid of ultrahigh frequency oscillations, which are easily transmitted, is discussed. Industrial equipment and motors, however, require direct current. With the discovery of the inversibility of the planotron and magnetron, the energy of ultrahigh frequency oscillations may be converted into direct current by reversing the directions of the electric and magnetic fields. R.T.K.

N64-11230* Ohio State U. Research Foundation, Columbus
ON THE CORRELATION RADIOMETER TECHNIQUE, II
K. Fujimoto 1 Aug. 1963 27 p refs
(NASA Grant NsG-74-60)
(NASA CR-52684; Rept. 1093-16) OTS: $2.60 ph, $1.01 mf

The two basic types of correlation radiometer, the IF type and the envelope-detection type (ENV type), are discussed and compared. The signal-to-noise ratio at the output, and the minimum detectable temperature increments, are expressed in terms of the signal-to-noise ratios at the inputs. These results have shown that the IF type is superior to the ENV type in terms of the sensitivity and should be used, except where the phase information of the two input signals is uncorrelated. The effects of gain fluctuations upon the minimum detectable temperature have been compared for the IF, ENV, and Dicke types of systems. It was found that the IF and Dicke systems gave comparable results but that the effects of gain fluctuations in the ENV type of system were poorer than in the IF type of system. It was also shown that phase fluctuations in the receivers could result in large degradations in the system sensitivity. J.E.T.

09 ELECTRONICS

Includes circuits and circuit theory; electronic components (e.g., tunnel diodes, transistors, and tubes); and feedback and control theory. *For related information see*: 06 Auxiliary Systems; 08 Communications; 15 Instrumentation and Photography; 22 Navigation and Guidance; and 25 Physics, Solid-State.

N64-10717 Joint Publications Research Service, Washington, D.C.
ALLOYS OF THE RARE METALS WITH BORON AND SILICON FOR CERTAIN RADIO AND ELECTRICAL APPLICATIONS
G. V. Samsonov and V. S. Neshpor 20 Feb. 1963 33 p refs
Transl. into ENGLISH from Redkie Metally i Splavy, Tr. Pervogo Vses. Soveskch. Po Splavam Redkikh Metal., Akad. Nauk SSR, Inst. Met., 1957 (Moscow), 1960 p 392–417
(JPRS-17750; OTS-63-21181) OTS: $1.00

An investigation was made of the physical properties, application and techniques for the production of alloys of the rare and rare earth metals with boron and silicon. R.T.K.

N64-10749 Joint Publications Research Service, Washington, D.C.
DEVELOPMENT AND APPLICATION OF COLD CATHODE TUBE
T. Fyetisov 18 Mar. 1963 8 p Transl. into ENGLISH of an article from Nyedelya (Moscow), no. 7, Feb. 10–16, 1963 p 11
(JPRS-18179; OTS-63-21342) OTS: $0.50

A new type of electronic tube, the cold cathode tube, has been developed. The tube operates on a self-stabilized gas discharge principle, is durable and reliable, and withstands accelerations to 25,000 g. D.E.R.

N64-10758 Joint Publications Research Service, Washington, D.C.
CATHODE RAY TUBE SCREENS
V. I. Rakov 26 Mar. 1963 8 p Transl. into ENGLISH of sect. 27, chapter three of a book "Indikatornyye ustroystva radiolokatsionnykh stantsiy" Leningrad, Union State Publishing House of the Shipbuilding Ind., 1962 p 205–208

A general survey of uses and development of cathode-ray-tube screens is presented. The phosphors used for cathode-ray-tube screens must effectively transform the electron-beam energy into light radiation; they must be readily evacuated materials, must provide the necessary illuminating characteristics regarding color of light and length of persistence, and must have a sufficiently good stability and length of service. Light emission from phosphors is increased by small traces (to 0.01%) of metals, called activators. A small change in the amount of activator has a considerable effect on the color of emitted light and the length of persistence. The phenomenon of "fatigue" in a phosphor is evidenced by a temporary decrease in light output as a result of prolonged electron bombardment. Phosphor fatigue can be observed particularly by exciting the screen with repeated high-power impulses. P.V.E.

N64-10813 Joint Publications Research Service, Washington, D.C.

NONLINEAR EFFECTS AND PARAMETRIC REGENERATION DURING THE INTERACTION OF WAVES IN WAVEGUIDE SYSTEMS WITH LONG ELECTRON FLOWS

S. A. Akhmanov et al (Moscow State U.) 6 May 1963 15 p refs Transl. into ENGLISH from Zhur. Tekh. Fiz. (Leningrad), v. 33, no. 1, 1963 p 90–99
(JPRS-19051; OTS-63-21747) OTS: $0.50

This is a report on the results of an experimental study of the interaction of waves in waveguide systems with long electron flows. The experiments were carried out in the centimeter and decimeter wavelength ranges with a free-drift electron flow (nonlinear space-charge wave interaction) and an electron beam associated with a retarding system (nonlinear interaction of space-charge waves with retarding system field). Special attention was devoted to the study of factors determining the effectiveness of parametric regeneration running waves of a small signal by the energy of intensive injection running waves; the ratio of signal and injection frequencies varied over wide limits. It has been established that in systems of this type, as a rule, it is necessary to deal with a considerable number of combination frequencies which substantially affect the course of nonlinear and parametric processes. Author

N64-10851 Joint Publications Research Service, Washington, D.C.

SOVIET PATENTS FOR ELECTRONIC EQUIPMENT

20 Nov. 1963 106 p Transl. into ENGLISH of 32 Russian language patents submitted between 1952–1962 to the Central Bur. of Tech. Inform., Moscow
(JPRS-21953; OTS-63-41181) OTS: $2.50

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N64-11024 Joint Publications Research Service, Washington, D.C.

THE SIGNIFICANCE OF CYBERNETICS IN SCIENCE, TECHNOLOGY AND ECONOMY IN THE GERMAN DEMOCRATIC REPUBLIC

P. Neidhardt 8 Mar. 1963 9 p Transl. into ENGLISH of an article from Nachrichtentechnik (E. Berlin), v. 13, no. 1, Jan. 1963 p U1–U3
(JPRS-18033; OTS-63-21284) OTS: $0.50

Cybernetics in science, technology, and economics in the German Democratic Republic was approached from the view of its significance (in a conference) by the Cybernetics Commission under the auspices of the Secretary General of the German Academy of Sciences. The significance of cybernetics has been stated to rest, in the final analysis, on the fact that it has introduced a new point of view into medicine, biology, political economics, and technology, based on abstract reasoning and the examination of the relationships between structure

and function. This approach has lead, in many areas, to a new method of scientific work and to very significant results. During the course of the conference the following papers were planned for presentation: "Philosophy and Cybernetics"; "Mathematics and Cybernetics"; "Political Economy and Cybernetics"; "Psychology and Cybernetics"; "Vocational Training and Cybernetics"; and, finally, "Medicine and Cybernetics."
C.L.W.

N64-11083* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE SATELLITE TRAVELING-WAVE TUBE

M. G. Bodmer, J. P. Laico, E. G. Olsen, and A. T. Ross *In its* Telstar I, Vol. 3 Jun. 1963 p 1703–1748 refs (See N64-11079 02-01)

The traveling-wave tube amplifier described provides a minimum output power of 3.5 w at 4.0 to 4.2 Gc. Design aspects that lead to lifetimes in excess of 10 years, and to tube efficiencies between 35 to 40 percent are discussed. The tube is focused by an improved version of the single-reversal magnetic circuit. Performance data pertinent to this particular satellite operation are shown. Author

N64-11084* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE DESIGN AND CONSTRUCTION OF THE ELECTRONICS PACKAGE

R. H. Shennum and E. J. Reid *In its* Telstar I, Vol. 3 Jun. 1963 p 1749–1763 refs (See N64-11079 02-01)

The electronics system of the Telstar satellite is described from the point of view of philosphy of design and construction rather than that of circuit details. The reliability is emphasized, and steps taken to preserve the inherent reliability of the components are discussed. The physical construction of modules, subsystems, and finally the entire system is described, including the foam encapsulation and the eventual hermetic sealing of the canister. Author

N64-11087* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE GROUND STATION HIGH-POWER TRAVELING-WAVE TUBE

R. J. Collier, G. D. Helm, J. P. Laico, and K. M. Striny *In its* Telstar I, Vol. 3 Jun. 1963 p 1829–1861 refs (See N64-11079 02-01)

The M4040 is a 2-kw CW traveling-wave tube developed specifically for communications applications. It was used as the power amplifier in the Project Telstar ground transmitter. Analytic methods employed in the design of the electron gun, the beam collector, the RF circuit, and the output match are presented. Typical performance characteristics and drawings of the tube subassemblies serve to describe the electrical and physical features of the M4040 traveling-wave tube. Methods used to inhibit oscillation, and the effects of ion drainage and collector depression on tube performance, are also discussed.
Author

N64-11088* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MASERS FOR THE TELSTAR SATELLITE COMMUNICATIONS EXPERIMENT

W. J. Tabor and J. T. Sibilia *In its* Telstar I, Vol. 3, Jun. 1963 p 1863–1886 refs (See N64-11079 02-01)

This paper discusses the design and characteristics of ruby traveling-wave masers operating at 4 Gc. These masers, characterized by an average gain of ≈ 35 db over a bandwidth of 25 Mc, are equipped with waveguide input transmission lines, rather than the previously employed coaxial cables. This change results in an overall noise temperature of 3.5° K for these devices, rather than the 10° K exhibited by earlier masers. The maser noise temperature now closely approximates sky temperatures, which set the ultimate limit on earthbound receiver sensitivity. The improvements to be had by further reduction in amplifier noise are therefore almot negligible. A less well known maser property, i.e., its freedom from distortion, even when driven well into gain saturation, is discussed.
Author

N64-11089* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

4-gc PARAMETRIC AMPLIFIER FOR SATELLITE COMMUNICATION GROUND STATION RECEIVER

M. Uenohara, M. Chruney, K. M. Eisele, D. C. Hanson, and A. L. Stillwell *In its* Telstar I, Vol. 3 Jun. 1963 p 1887–1908 refs (See N64-11079 02-01)

The amplifier consists of two cascaded stages of similar design: the first of these is operated at liquid-nitrogen temperature and the second at room temperature. One 23-Gc pump source is used for both amplifier stages. The combination of the two amplifier stages provides 38-db overall gain, 45° K overall system input noise temperature, 60-Mc bandwidth, 0.1-db short-term gain stability, and 0.3-db long-term gain stability. A carefully designed cryogenic system maintains the amplifier refrigerated with only infrequent refilling of the dewar, i.e., once every 10 days. Author

N64-11155 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

USE OF TRANSISTORS FOR CONVERTING DIRECT CURRENT

Yu. K. Zakharov 1 May 1963 13 p refs Transl. into ENGLISH of an article from the book "Poluprovodnikovyye Pribory i ikh Primeneniye" (Moscow), no. 4, 1960 p 298–307
(FTD-TT-63-179/1+2; AD-403309)

Experimental material is presented on the use of transistors for the conversion of direct current. To convert direct current, flat triodes are used which have little output resistance in the open system, great resistance in the closed system, and allow for commutation of strong currents. R.T.K.

N64-11214 Joint Publications Research Service, Washington, D.C.

ELECTRONICS – BROAD ROAD TO INDUSTRY

K. Martyushov et al 22 Apr. 1963 36 p Transl. into ENGLISH of several articles from Ekon. Gaz. (Moscow), no. 9 (82), 2 Mar. 1963 p 7–12
(JPRS-18816; OTS-63-21626) OTS: $1.00

The problems related to acceleration of the development of the electronics industry were discussed at the regular session of the "Business Club" R.T.K.

N64-11286 Ampex Corp., Redwood City, Calif.

DESIGN OF FILTERS AND NETWORKS

E. Pezirtzoglou Oct. 1963 208 p
(TR-62-11)

The problem in filter design is the synthesis of networks having prescribed amounts of discrimination between the wanted and the unwanted bands of the frequency spectrum. The following topics are covered concerning the design of filters and networks: (1) electric filters, (2) M-derived sections, (3) filters with Tchebycheff response, (4) Butterworth characteristic filters, (5) linear phase shift video filters, (6) phase equalizers, (7) amplitude equalizers, (8) delay lines, and (9) measurement of distributed capacitance of coils. R.T.K.

N64-11367 European Atomic Energy Community, Brussels (Belgium)
TEMPERATURE DEPENDENCE OF CIRCUITS USING TWO EMITTER COUPLED TRANSISTORS
L. Stanchi Joint Nuclear Research Center, Ispra Establishment, (Italy), Engineering Dept., Electronics Service [Oct.] 1963 20 p refs
(EUR-370.e) Available from Belgian American Bank and Trust Co., N.Y. account no. 121.86: 40 Bel. Fr.

The parameters of the transistors which are influenced by temperature are examined. The analysis is made for difference amplifiers and Schmitt triggers and in general for circuits which have two transistors with the emitters connected together. The theoretical investigation is followed by some results which were obtained on real transistors. As an example, the application to the Schmitt trigger circuit is given in order to demonstrate that, using simple design criteria and selection of components, it is possible to arrive at a remarkable stability without the use of a thermostat. Author

10 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases, ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands and wind tunnels); test ranges; and tracking stations. *For related information see*: 06 Auxiliary Systems.

N64-10880* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GROUND TRANSMITTER AND RECEIVER
A. J. Giger, S. Pardee, Jr., and P. R. Wickliffe, Jr. *In its* Telstar I, Vol. 1 Jun. 1963 p 1063–1107 refs (See N64-10868 02-01)

Ground station equipment for the Telstar experiment includes a 6-kmc transmitter and a 4-kmc receiver used for television and telephone channels. This paper describes the overall transmitting and receiving arrangements and presents detailed accounts of the RF and power-supply subsystems. Information is also presented on protection, control and equipment features, and on receiver noise performance. Author

N64-10891* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLANNING, OPERATION AND EXTERNAL COMMUNICATIONS OF THE ANDOVER EARTH STATION
D. H. Smith, C. P. Carlson, R. J. Mc Cune, R. E. Elicker, and R. E. Sageman *In its* Telstar I, Vol. 2, Jun. 1963 p 1383–1420 refs (See N64-10882 02-01)

This paper relates some of the considerations in the planning of the Andover, Maine, earth station. It describes the station layout, the operating plan, and the Long Lines interconnections. Power facilities, air conditioning, heating and dehumidification arrangements are also covered. Author

N64-10892* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PARTICIPATION OF THE HOLMDEL STATION IN THE TELSTAR PROJECT
William C. Jakes, Jr. *In its* Telstar I, Vol. 2, Jun. 1963 p 1421–1447 refs (See N64-10882 02-01)

The facility for satellite communication studies at Holmdel, New Jersey, was originally established to take part in Project Echo. This paper describes the modifications required to participate in the Telstar experiments and the results obtained during operations. Reception of television from the satellite was successfully accomplished, studies were made of the signal levels, and the changes with time of the satellite spin rate and spin-axis orientation were determined. Author

N64-10908 American Inst. of Aeronautics and Astronautics, New York, N.Y.
AIAA SIMULATION FOR AEROSPACE FLIGHT CONFERENCE, A VOLUME OF TECHNICAL PAPERS PRESENTED AUGUST 26-28, 1963, COLUMBUS, OHIO
[1963] 374 p refs AIAA: $5.00 Member, $10.00 Nonmember

CONTENTS:

1. PILOTED SIMULATOR STUDIES PERTAINING TO THE LOW-SPEED LONGITUDINAL HANDLING QUALTIES OF A SUPERSONIC TRANSPORT AIRPLANE Richard S. Bray (NASA, Ames Research Center) p 35–43 refs (See N64-10909 02-14)
2. INTEGRATED MISSION SIMULATION FOR LONG TERM SPACE FLIGHT Milton A. Grodsky and John P. Bryant (Martin Co., Baltimore) p 147–153 refs (See N64-10910 02-30)

N64-11366 Oak Ridge National Lab., Tenn.
SAFETY ANALYSIS OF THE OPERATION OF THE HIGH-RADIATION-LEVEL EXAMINATION LABORATORY
A. R. Olsen, J. P. Nichols, and Sigfred Peterson 5 Dec. 1963 89 p refs
(Contract W-7405-eng-26)
(ORNL-3479) OTS: $2.00

The High-Radiation-Level Examination Laboratory (HRLEL) is built and equipped to permit remote disassembly and complete examination of highly irradiated materials, including reactor fuel elements, other reactor components, and irradiation experiments, within the completely contained complex of shielded cells. The structural and mechanical features of the building have been reviewed in the light of proposed operations and credible accidents. The resulting data outline the effects of such accidents on personnel and the environs from the viewpoints of possible radiation exposure and contamination. The maximum credible effects are presented along with the contingent controls that reduce the probability of such accidents ever happening to near zero. Author

11 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; 13 Heat Transfer and Thermodynamics; and 24 Physics, Plasma.

N64-10788 Joint Publications Research Service, Washington, D.C.
A MATHEMATICAL ANALYSIS OF RECTILINEAR FORMS PERCEIVED VISUALLY

V. S. Ivanov *In its* Transl. from Voprosy Psikhologii (Prob. of Psychology) [Moscow] no. 5, Sep.–Oct. 1962 16 Apr. 1963 p 25–37 refs (See N64-10786 02-16) OTS: $1.75

The mathematical relation between the true form of a spatial object and that perceived visually is discussed in an effort to provide solutions to a number of problems in this area, which are based on contemporary progress made in the psychology of visual perception of spatial objects. The significance of visual perception of spatial objects is discussed in terms of being able to give a realistic representation of a spatial object in a drawing. The difference in nature of the visual impression derived from an object and that of a flat representation is also discussed. C.L.W.

N64-11025 California Inst. of Tech., Pasadena Div. of Eng. and Appl. Sci.

A GENERAL ANALYSIS OF THE STABILITY OF SUPERPOSED FLUIDS

Milton S. Plesset and Din-Yu Hsieh Oct. 1963 29 p refs
(Contract Nonr-220(28))
(Rept. 85-26; AD-422616)

The problem studied may be formulated as follows: in the initial state, two fluids are separated by a plane interface at $y = 0$. Both viscosity and surface tension are neglected, but the effects of compressibility are retained. In the region $y > 0$, the upper fluid, fluid 1, moves as a whole in the x-direction with the velocity U_1, and in the region $y < 0$, the lower fluid, fluid 2, also moves as a whole in the x-direction with velocity U_2. A constant force of magnitude g per unit mass acts in the y-direction. It is now supposed that the interface is perturbed by a disturbance of the form $ae^{i(nt - \sigma x)}$ where the amplitude $\underline{a}$ is taken to be small. When the kinematic and dynamic boundary conditions are satisfied for the perturbed problem, the velocity potentials may be expressed in terms of the solutions of Whittaker's differential equation. The dispersion relation for the frequency $\underline{n}$ involves the Whittaker functions and their first derivatives. From this general relation, one may particularize to various physical situations each of which is described by an appropriate limit of the confluent hypergeometric functions. Author

N64-11091 McGill U., Montreal (Canada) Mechanical Engineering Research Labs.

COANDA FLOW OF A TWO-DIMENSIONAL WALL JET ON THE OUTSIDE OF A CIRCULAR CYLINDER

G. I. Fekete Aug. 1963 138 p refs
(DRB Grant 9551-12)
(Rept. 63-11)

An incompressible wall jet flowing over the surface of a cylinder, with the fluid in the jet being the same as that in the still surroundings, has been investigated experimentally. The results for the velocity and surface pressure distribution, the slot velocity, and the position of separation measurements are presented. Similarity of velocity profiles over the major portion of the flow is confirmed and good agreement is found between the nondimensional velocity profiles and the theoretical prediction of Glauert for plane wall jets. The position where the wall jet separates from the cylinder was determined for smooth and rough cylinders, and the experiments indicate that roughness causes earlier separation. The ratio of actual-to-theoretical jet momentum at the slot, an improved law governing the growth of the jet, and the constant for the position of the hypothetical origin relation have been determined. Author

N64-11150 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

HYDRAULIC POWER AMPLIFIERS [GIDRAVLICHESKIYE USILITELI MOSHCHNOSTI]

V. A. Khokhlov Transl. into ENGLISH of book Moscow, Publ. House of the Acad. Sci. USSR, 1961 11 Jun. 1963 146 p refs
(FTD-TT-62-1226/1+2; AD-413571)

The topics discussed are: (1) the components of hydraulic actuators and their characteristics, (2) classification and line diagrams of hydraulic actuators, (3) designs, basic parameters, and characteristics of hydraulic amplifiers, (4) analysis of the statics and dynamics of hydraulic amplifiers without feedback, (5) analysis of the statics and dynamics of hydraulic amplifiers with feedback, and (6) electromechanical transducers. R.T.K.

N64-11160 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

EXPERIMENTAL INVESTIGATION OF THE EFFECT OF A TRANSVERSE MAGNETIC FIELD ON VELOCITY DISTRIBUTION IN A MERCURY FLOW

G. G. Branover, I. M. Kirks, and O. A. Liyelausis 25 Apr. 1963 12 p refs Transl. into ENGLISH from the book "Prikladnaya Magnitogidrodinamika, Tr. Inst. Fiz., AN Latviyskoy SSR, no. 12, 1961 p 167–175
(FTD-TT-62-1827/1+2; AD-417758)

An experimental investigation was conducted on the hydrodynamic phenomena in liquid mercury in a stationary channel in the presence of a transverse magnetic field. Included in the investigation were the measuring of the velocity distribution at various Reynolds and Hartman values and the determination of the coefficient of resistance. C.L.W.

N64-11207 California U., Berkeley Lawrence Radiation Lab.

POWER REQUIREMENTS FOR MIXING OF LIQUID-GAS SYSTEMS

Michael Wayne Clark and Theodore Vermeulen 30 Aug. 1963 67 p refs
(Contract W-7405-eng-48)
(UCRL-10996) OTS: $1.50

The power requirements of agitated liquid–gas systems using both four-bladed flat-paddle impellers and a four-bladed turbine in a baffled cylindrical tank have been investigated. The power-number reduction has been related qualitatively to cavitation, and is correlated as a function of Weber number, geometrical factors, and the volumetric gas holdup. The gas holdup has been found to vary with impeller speed and impeller dimensions, as well as gas flow rate and liquid properties. Incipient vortex formation, whereby air is introduced downward into an agitated liquid, was encountered and investigated. A correlation involving geometrical factors and the Froude number was developed to predict the onset of this phenomenon and the subsequent power-number behavior. Author

N64-11213 Joint Publications Research Service, Washington, D.C.

MASS TRANSFER IN TURBULENT FLOW THROUGH THE ORIFICE OF A CHAMBER

V. A. Baum and I. Sakr 17 Apr. 1963 14 p refs Transl. into ENGLISH of an article from Izv. Akad. Nauk SSSR, Otd. Tekhn. Nauk: Energ. i Avtom. (Moscow), no. 3, 1962
(JPRS-18756; OTS-63-21599) OTS: $0.50

An estimation of the rate of mass transfer between the fluid in a solar furnace chamber, with respect to its direction is necessary for the design of such furnaces. Calculation of the amount of "blow-off" of fluid from the chamber was made on the basis of flow-patterns selected mathematically to describe the basic boundary conditions of the flow-pattern process. R.T.K.

N64-11235* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
AN EXPERIMENTAL INVESTIGATION OF THE VISCOUS DAMPING OF LIQUID SLOSHING IN SPHERICAL TANKS
Irving E. Sumner and Andrew J. Stofan Washington, NASA Dec. 1963 31 p refs
(NASA TN D-1991) OTS: $0.75

An experimental investigation was conducted to determine the viscous slosh-damping characteristics of several liquids having a wide range of kinematic viscosities. The tests were conducted with three rigid spherical tanks 9.5, 20.5, and 32.0 inches in diameter. The kinematic viscosity of the contained liquid was varied from 1.23×10^{-6} to 1.183×10^{-2} ft^2/sec by utilizing mercury, acetylene tetrabromide, and several mixtures of water and glycerine. The first-mode slosh-force parameter was generalized for all values of kinematic viscosity and tank diameter investigated, when presented as a function of dimensionless viscosity and excitation-amplitude parameters. The average first-mode damping ratio was observed to be independent of the excitation amplitude over the range investigated, and was generalized for all values of kinematic viscosity and tank diameter when presented as a function of the dimensionless viscosity parameter only. Author

N64-11387 College of Aeronautics, Cranfield (Gt. Brit.)
GREEN'S FUNCTIONS AND THE NON-EQUILIBRIUM EQUATION WITH APPLICATIONS TO NON-EQUILIBRIUM FREE STREAMS
J. F. Clarke and J. W. Cleaver Apr. 1963 40 p refs
(CoA-Aero 163)

The propagation of small disturbances in a relaxing or reacting gas is governed by a third-order partial differential equation for the velocity potential (the nonequilibrium equation). A generalized Green's theorem which applies to this equation is established, and Green's functions are found for supersonic and subsonic steady flows in two dimensions. These functions are used to find solutions for the flow past slender obstacles. For subsonic streams, the flow field is assumed to be of infinite extent; for a supersonic stream, fields are considered to be of finite extent. The method permits comparatively easy analysis of supersonic streams which are not necessarily in equilibrium or of uniform velocity ahead of the body. Three examples of such flows are worked out. Author

12 GEOPHYSICS

Includes auroral phenomena; upper atmosphere studies; oceanography; cartography; geodesy; and geomagnetism. *For Van Allen belts see*: 28 Space Radiation. *For related information see*: 05 Astronomy and Astrophysics; 21 Meteorology; and 29 Space Sciences.

N64-10731 Joint Publications Research Service, Washington, D.C.
DETERMINING DIMENSIONS OF A REFERENCE ELLIPSOID AND GEODETIC DATUM ON THE BASIS OF ARTIFICIAL SATELLITE OBSERVATION
Milan Bursa (Geodetic Res. Inst., Prague) 7 Mar. 1963 10 p refs Transl. into ENGLISH from Studia Geophys. Geodaet., Ceskoslov. Akad. Ved (Prague), v. 6, no. 4, 1962 p 407–409
(JPRS-18002; OTS-63-21270) OTS: $0.50

The use of observation by an artificial satellite to determine dimensions of a reference ellipsoid and geodetic data is discussed. The possibility of being able to calculate the rectangular spatial coordinate of the point of observation M_O (X_O, Y_O, Z_O) relative to the center of mass of the earth, if the observed topocentric and geocentric equatorial coordinates and the distances of artificial satellite for the same instant of Greenwich star time S are known, and the obtaining of the X_O, Y_O, and Z_O of the point of observation in certain cases when some of the quantities of the topocentric and geocentric coordinates are not known are considered. C.L.W.

N64-10736 Joint Publications Research Service, Washington, D.C.
A CONTRIBUTION TO THE FORMATION OF SUBTROPICAL ANTICYCLONES
Vojtech Vitek 7 Mar. 1963 9 p refs Transl. into ENGLISH of an article from Studia Geophys. et Geodaet. (Prague), v. 6, no. 4, 1962 p 400–406
(JPRS-18011; OTS-63-21274) OTS: $0.50

Equations are derived for subtropical anticyclone motion in vector form, for the pseudogeostrophic relative magnitude of vorticity, the Coriolis parameter, and for the absolute vorticity. A discussion of anticyclogenesis is included, and reasons are given why the cyclonic analogy of the subtropical quasi-stationary anticyclones is dynamically impossible on the level surface of the earth. J.E.T.

N64-10743 Joint Publications Research Service, Washington, D.C.
EARTH PENETRATION IN DEPTH
R. Bakhtamov and G. Karasik 14 Mar. 1963 9 p Transl. into ENGLISH from Izobretatel' i Ratsionalizator (Moscow), no. 10, Oct. 1962 p 15–16
(JPRS-18130; OTS-63-21324) OTS: $0.50

Future deep-drilling projects are cited and problems in deep drilling are examined. These include the maintenance of the quality of the clayey solution used to flow the well, the cohesiveness of the cement mixture which fills the space between the walls of the well and the casing tubing, and the size and complexity of machinery required for deep drilling. J.E.T.

N64-10761 Joint Publications Research Service, Washington, D.C.
MAGNETOTELLURIC SOUNDING IN GEORGIA
G.A. Chernyavskiy and G. Ya. Gugunava *In its* Soviet Geophys. and Meteorol. Res. in 1962 28 Mar. 1963 p 1–8 refs (See N64-10760 02-01) OTS: $1.00

On the basis of the results on magnetotelluric sounding work, it is shown that the introduction of magnetotelluric exploration is very promising in Georgia when combined with other geological and geophysical methods. Author

N64-10764 Joint Publications Research Service, Washington, D.C.
APPLICATION OF SEISMO-ACOUSTIC RADIOBUOYS FOR STUDYING THE EARTH'S CRUSTAL STRUCTURE IN THE AREA OF THE INDIAN OCEAN
Yu. P. Neprochnov and G. N. Lunarskiy (Acad. of Sci. USSR) 28 Mar. 1963 27 p refs Transl. into ENGLISH from Okeanol. (Moscow), v. 3, no. 1, Jan. 1963 p 76–87
(JPRS-18425; OTS-63-21453) OTS: $0.75

In studying the crustal structure in the area of the Indian Ocean, three profiles were obtained using seismoacoustic radiobuoys: (1) in the western sector of the Indo-Australian

Basin (profile II-B), (2) in the southwestern slope of the Java Trough, not far from the trough's axis (profile III-B), and (3) in the southern part of the Arabian Sea basin in the depression between two submarine elevations located south and north of the region of the investigations (profile I-B). Profile II-B indicated a crust structure consisting of a sedimentary layer 0.3 to 0.5 km thick, a basaltic layer 6.5 ±1.5 km, and, below this, a subcrustal layer. Profile III-B indicated a structure of nonconsolidated sediments 0.2 to 0.5 km thick, and volcanic rock and lithified sediments layer 2.0 km thick on basaltic layer. Profile I-B showed a structure of sedimentary layer of about 1.0 km thickness on top of a basaltic layer. P.V.E.

N64-10817 Joint Publications Research Service, Washington, D.C.

SOVIET ATMOSPHERIC OBSERVATIONS DURING INTERNATIONAL GEOPHYSICAL YEAR

20 May 1963 65 p refs Transl. into ENGLISH of two articles from Trudy Glavnoi Geofiz. Observatorii im. A. I. Volikova (Leningrad), no. 134, 1962 p 38–74; 102–112
(JPRS-19275; OTS-63-21857) OTS: $1.75

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1. TROPOPAUSE WAVES IN UPPER LATITUDES DURING IGY M. P. Churinova p 1–47 refs (See N64-10818 02-12)

2. CERTAIN CHARACTERISTICS OF INTERLATITUDE EXCHANGE IN LOWER STRATOSPHERE BASED ON OBSERVATIONS OF ATMOSPHERIC OZONE G. P. Gushchin and R. G. Romanova p 48–62 refs (See N64-10819 02-12)

N64-10818 Joint Publications Research Service, Washington, D.C.

TROPOPAUSE WAVES IN UPPER LATITUDES DURING INTERNATIONAL GEOPHYSICAL YEAR

M. P. Churinova *In its* Soviet Atmospheric Observations During Intern. Geophys. Yr. 20 May 1963 p 1–47 refs (See N64-10817 02-12) OTS: $1.75

This article deals with the characteristics of long-period waves in the tropopause at the main isobaric surfaces, and at ground-level pressure, on the basis of processing by the periodogram method, radiosonde observations of three Arctic stations and the Voyeykovo station during the International Geophysical Year. The connection between tropopause fluctuations and tropospheric waves of pressure and temperature is shown. Consideration is given to the forms of circulation and to the succession of cyclonic and anticyclonic fields in the high altitudes. Author

N64-10819 Joint Publications Research Service, Washington, D.C.

CERTAIN CHARACTERISTICS OF INTERLATITUDE EXCHANGE IN LOWER STRATOSPHERE BASED ON OBSERVATIONS OF ATMOSPHERIC OZONE

G. P. Gushchin and R. G. Romanova *In its* Soviet Atmospheric Observations During Intern. Geophys. Yr. 20 May 1963 p 48–62 refs (See N64-10817 02-12)

A method for using the data on the overall content of atmospheric ozone in order to obtain estimates of interlatitude macroturbulence of the lower stratosphere is presented. Examination of the estimates obtained indicates that the value of the coefficient of interlatitude macroturbulent exchange in the lower stratosphere fluctuates about values of the order of 10^6 to $10^7 m^2/sec$. These values of the exchange coefficient K are close to the corresponding value of K in the troposphere. It is concluded that the proposed method makes it possible to obtain only an approximate estimate of K for the lower stratosphere. In order to obtain more precise values of K, it would be necessary to set up a more dense and uniform network of ozonometric stations. P.V.E.

N64-10836 Joint Publications Research Service, Washington, D.C.

DEEP DRILLING AS A METHOD OF STUDYING THE EARTH'S CRUST

N. A. Belyayevskiy and V. V. Fedynskiy (State Geol. Comm. USSR) 26 Jun. 1963 10 p Transl. into ENGLISH from Izvest. Akad. Nauk SSSR, Ser. Geol. (Moscow), no. 5, May 1963 p 3–8
(JPRS-19887; OTS-63-31134) OTS: $0.50

The problem of superdeep drilling, for the purpose of identifying the composition and physical state of the deep layers of the earth's crust and upper mantle, is discussed. Superdeep drilling should lead to new knowledge concerning the depths of the earth and the occurrence and distribution of minerals, petroleum, and gas. The technology and instrumentation needed for deep drilling is also discussed, and the geological considerations which should determine the selection of the drilling sites are formulated. R.T.K.

N64-10913* General Electric Co., Santa Barbara, Calif.

ATMOSPHERIC RADIATIVE TEMPERATURE MEASUREMENT

R. A. Smith *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 37–49 refs (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

An analysis is presented for determining the accuracy and altitude resolution that is possible with a relatively simple inversion process specifically applicable to temperature measurement. This inversion process is based on sensing thermal radiation within the diatomic-oxygen absorption band (at γ ≈ 0.5 cm). At this wavelength, the intensity of thermal radiation is linearly related to an absorptive region's kinetic temperature. At frequencies corresponding to the stronger resonances, the atmosphere appears fairly absorptive up to 100 km. I.v.L.

N64-10922* Northrop Corp., Needham, Mass. Nortronics Div.

SIGNIFICANCE OF RADIATIVE SKY TEMPERATURE IN THE DETERMINATION OF THE APPARENT TEMPERATURES OF MATERIALS

R. A. Porter *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 157–174 refs (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

The effect of weather and ground cover on the performance of a mapping radiometer was studied; the results of a quantitative comparison of the performance of such radiometric systems operating at 16 Gc with those operating at 35 Gc are discussed. The significant influence of radiated sky temperature on materials is described, and a simple method for calculating the apparent temperature of materials, such as water, ice, concrete, and asphalt, from 10 km down to ground level is presented. I.v.L.

N64-11065 Joint Publications Research Service, Washington, D.C.

PROBLEMS OF DRILLING A SUPERDEEP WELL FOR THE STUDY OF THE STRUCTURE OF THE EARTH'S CRUST IN AZERBAYDZHAN

A. A. Ali-Zade, G. A. Akhmedov, V. I. Kulikov, D. L. Tereshkin, and N. I. Shapirovskiy 17 May 1963 26 p refs Transl. into ENGLISH of an article from Sov. Geol. (Moscow), no. 2, Feb. 1963 p 3–16
(JPRS-19264; OTS-63-21850) OTS: $0.50

The drilling of a superdeep well will enable clarification of many problems concerning the causes of magmatism and vulcanism, and the origin and prognosis of earthquakes, as well as the following: (1) determination of the correlation between various layers of the sedimentary complex and clarification of the character of their possible oil and gas content; (2) uncovering of the entire thickness of the metamorphic layers of the bedrock for the purpose of clarification of the composition of the crystalline layers of the earth's crust; and (3) establishment of the character of temperature and pressure change along the shaft of the well and clarification of the presence of high-temperature zones. P.V.E.

N64-11074* Geophysics Corp. of America, Bedford, Mass.
MEASUREMENTS OF ELECTRON DENSITY PROFILE IN THE NIGHTTIME E REGION
L. G. Smith Jun. 1963 24 p refs Presented at the Spring URSI Meeting, Washington, 1 May 1963 24 p refs
(NASA Contract NASw-489)
(NASA CR-52553; GCA-TR-63-22-N) OTS: $2.60 ph, $0.92 mf

The nighttime profiles differ from midday profiles in two main respects, (1) the E layer is irregular at night and smooth in the day, and (2) the E layer is clearly separated from the F region at night by a deep trough; this trough is small or absent in daytime observations. A measurement at sunset showed a profile of the nighttime type though with appropriately higher values of electron density. An intense layer of Sporadic-E was found between 98 and 102 km during the flight of Nike-Cajun 10.99. Comparison with the wind profile obtained 28 minutes later shows the Sporadic-E layer to be associated with a shear in the E-W component and a maximum in the N-S component. A similar relation is found for a less intense layer occurring between 120 and 122 km. Author

N64-11128 Joint Publications Research Service, Washington, D.C.
CURRENT PROBLEMS IN SURVEYING AND MAPPING IN HUNGARY
Zoltan Antos 6 Jun. 1963 14 p Transl. into ENGLISH of an article from Geodezia is Kartografia (Budapest), v. 15, no. 2, 1963 p 81–85 Presented at the Geneva Meeting of Geodetic and Cartographic Soc., 18 Dec. 1962
(JPRS-19587; OTS-63-21999) OTS: $0.50

The following aspects of the geodetic and mapping activity are discussed: organization, technical methods, mechanization, automation, and instrumentation. R.T.K.

N64-11183 Geoscience Inc., Cambridge, Mass.
DEEP RESISTIVITY INVESTIGATION IN NORTHERN NEW YORK STATE
T. Cantwell and P. Nelson Sep. 1963 29 p refs
(Contract AF 19(628)-2351)
(AFCRL-63-385; AD-423052)

The survey was to provide supplementary information for deep strata communication studies undertaken by the United States Air Force. Field measurements were carried out to determine the resistivity of the anorthosite mass and make resistivity measurements around some existent drill holes. Measurements using 2 mile dipole lengths and separations up to 30 miles indicated a resistivity of about 25,000 ohm-meters for the anorthosite mass. Resistivity values increased with dipole separation to about 25,000 ohm-meters. There were no indications of a decrease at depth. Author

N64-11186 Pennsylvania State U., University Park Ionospheric Research Lab.
THE DETERMINATION OF THE WORLD-WIDE EFFECTIVE RECOMBINATION COEFFICIENT OF THE E-REGION
Frank D. Palluconi 1 Nov. 1963 62 p refs
(Contract AF 19(604)-4563; NSF Grant 18983)
(AFCRL-63-724; Sci. Rept. 198)

The effective recombination coefficient of the E region is evaluated at its maximum height on a worldwide basis near noon. This is accomplished using the comparison and relaxation methods in conjunction with critical E frequency data for the years 1957 through 1959. It was found that the effective recombination coefficient calculated in this way varied considerably with latitude and season. It is shown that the effects of electron drift and changes in relative ion concentration will be important in understanding this variation. Author

N64-11195* California U., La Jolla
ELECTRON MICROPROBE ANALYSIS OF SOME RARE MINERALS IN THE NORTON COUNTY ACHONDRITE
Klaus Keil and Kurt Fredriksson Repr. from Geochimi. Cosmochim. Acta, v. 27, 1963 p 939–947 Previously announced as N63-15301 12-07
(NASA Grants NsG-322 and NsG-317-63)

The following minerals were found: enstatite, forsterite, metallic nickel-iron, metallic copper, daubreelite, troilite, and two new species, titanoan troilite and ferromagnesian alabandite. The unusual association of minerals indicates that at the time this meteorite was formed the environment was strongly reducing. Author

N64-11233 National Aeronautics and Space Administration, Washington, D.C.
PLANETARY AERONOMY III: DETERMINATION OF ATMOSPHERIC PARAMETERS BY THE USE OF ROCKET-BORNE MASS SPECTROMETERS
R. F. K. Herzog, F. F. Marmo, R. A. Minzner, and G. O. Sauermann (Geophys. Corp. of Am., Bedford) Sep. 1963 42 p refs
Previously announced as N62-16683 17-12
(NASA Contract NASw-395)
(NASA CR-9; GCA-TR-62-2-N) OTS: $1.00

The analysis of the experimental data yielded information on the following: (1) the location and detection of the beginning of diffusive separation in the upper atmosphere; (2) a measure of the degree of diffusive separation in the transition region; (3) the location above which complete diffusive separation prevails; (4) an improved temperature–altitude profile from the beginning of diffusive separation up to extremely high altitudes; (5) determination of the temperature in the upper part of the mixed region of the atmosphere; (6) the possibility of detecting small perturbations of upper atmospheric temperature in local regions; and (7) a determination of the variation of mean molecular weight of the ambient air in the heterosphere. Author

N64-11242 Stanford U., Calif. Radioscience Lab.
THE ELECTRON DENSITY DISTRIBUTION IN THE F_2 LAYER OF THE IONOSPHERE IN WINTER
J. O. Thomas Repr. from J. Geophys. Res., v. 68, no. 9, May 1963 p 2707–2718

This paper describes the winter daytime enhancement of ionization observed under certain circumstances in the F region of the ionosphere. The existence and magnitude of this region of enhanced ionization (referred to as the winter spur) depends strongly on latitude and on the solar cycle epoch. Its relationship with the winter anomaly is discussed. The evidence seems to point to a downward flux of electrons from above the peak of the F_2 layer as the most likely cause of the winter spur. Author

N64-11252 Nagoya U., (Japan) Inst. of Plasma Physics
INTERACTION OF SOLAR PLASMA STREAMS WITH THE OUTER GEOMAGNETIC FIELD
Tatsuzo Obayashi (Kyoto U.) May 1963 22 p refs
(IPPJ-12)

It is shown that the outer geomagnetic field consists of two regions: the standing shock layer and the geomagnetic cavity. The shock layer appears beyond 10 earth radii in the sunward side even in a geomagnetically quiet period. The shape of the shock front is approximated as a hyperbola, with a standoff distance of the order of 5 earth radii. This standing shock layer is terminated by the geomagnetic field cavity inside. The ordinary shock theory of a continuous flow is applied, assuming that the interacting plasma is magnetized so that the mean free path may be replaced by the Larmor radius of the medium. The theoretical estimations of the shock position and the size of the geomagnetic cavity are then compared with the observed ones. It is found that the observed shock wave is consistent for a supersonic flow of Mach number 2 to 5. The estimated values of a typical quiescent solar plasma stream are $U = 400$ to $500\ km/s, n = 5/cm^3$ and $B = 10$ gamma. Author

N64-11266 Joint Publications Research Service, Washington, D.C.
HORIZONS OF AERIAL PHOTOGRAPHY
I. Nevyazhskiy and Yu. Trunin 25 Nov. 1963 13 p Transl. into ENGLISH of an article from Nauka i Zhizn' (Moscow), no. 9, 1963 p 28–33
(JPRS-22032; OTS-63-41232) OTS: $0.50

The basic features of aerial photographs which give a three-dimensional and colored image of a locality are considered. Examples are given of the uses of aerial photography in topography and geology. R.T.K.

N64-11268 Joint Publications Research Service, Washington, D.C.
SEISMOGRAPHIC INSTRUMENTS
25 Nov. 1963 219 p refs Transl. into ENGLISH of 13 articles from Tr. Inst. Fiz. Zemli, Akad. Nauk SSSR (Moscow), no. 26 (193), 1963 p 3–103
(JPRS-22038; OTS-63-41236) OTS: $3.50

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2. INSTALLATION FOR RE-RECORDING OF SEISMOGRAMS (UDPS) Yu. A. Kolesnikov, B. N. Pevzner, and V. N. Solov'ev p 26–42 refs
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7. INSTALLATION WITH MEMORY FOR THE RECORDING OF STRONG EARTHQUAKES V. M. Fremd p 124–147 refs
8. ACCELEROMETERS OF HIGH SENSITIVITY I. B. Sinani p 148–163
9. RECORDING INSTALLATION WITH MAGNETIC MEMORY FOR THE RECORDING OF REMOTE EARTHQUAKES V. P. Preograzhenskiy p 164–178 refs
10. HIGH SENSITIVITY CAPACITIVE SEISMOGRAPH WITH VISIBLE RECORD ON HEAT-SENSITIVE PAPER A. V. Rykov and I. B. Sidorov p 179–194 refs
11. SEISMIC OSCILLOGRAPH TYPE OSB-VI E. S. Borisevich, S. A. Kastroskiy, and M. S. Mosyagina p 195–205 refs
12. STAND FOR THE DETERMINATION OF THE COORDINATES OF THE EPICENTER OF AN EARTHQUAKE V. I. Kovrigina and I. M. Rozenberg p 206–211
13. VOLTAGE CONVERTER TO SUPPLY A SYNCHRONOUS-HYSTERESIS MOTOR I. M. Rozenberg p 212–215 refs

N64-11280 Defense Research Board, Ottawa (Canada)
GEOGRAPHIC DISTRIBUTION OF IONOSPHERIC DISTURBANCE IN THE F2 LAYER
Ye. V. Lavrova Apr. 1963 12 p refs Transl. into ENGLISH of an article from Tr. Inst. Zemnogo Magnetiyma, Ionosferi i Rasprostraneniya Radiovoln Akad. Nauk SSSR (Moscow), issue 19 (29), 1961 p 31–43
(T-384-R)

Ionospheric disturbance synoptic charts were used to study the geographic distribution of disturbances in the F_2 layer of the ionosphere. Examination of the longitudinal distribution graphs revealed that: (1) for a day or two before the commencement of a magnetic storm, the departure curves in the mean lie above the zero level; (2) at the commencement of a magnetic storm, the negative departures increase, reaching 80%; (3) during an active storm period, the negative departures extend to all longitudes, and are as much as 60% to 80%; and (4) at the end of a magnetic storm, the curves are observed to rise toward zero level. R.T.K.

N64-11285 Douglas Aircraft Co., Inc., Santa Monica, Calif. Missile and Space Systems Div.
RESULTS OF 30 mc/s RIOMETER OBSERVATIONS AT McMURDO SOUND, ANTARCTICA, FROM FEBRUARY THROUGH DECEMBER 1962
A. D. Goedeke, A. J. Masley, and B. W. Wahl Jun. 1963 43 p refs Presented to the Panel on Polar Cap Expt., 4th COSPAR Intern. Space Sci. Symp., Warsaw, June 3–11 1963
(Douglas Paper 1655)

During 1962, two polar cap absorption events were observed. These events, which occurred in February and October, were rather small in magnitude, resulting in peak absorptions of about one db. The solar protons responsible for the events were observed by Mariner II and the Injun I and Explorer XII satellites. The protons associated with the February event did not exceed an energy of 40 Mev, while those associated with the October event had energies of at least 210 Mev. This paper discusses the absorption events, equipment, objectives of the research, and a description of a new station, magnetically conjugate to McMurdo. Author

N64-11298* Geophysics Corp. of America, Bedford, Mass.
ON THE QUESTION OF TURBULENCE IN THE UPPER ATMOSPHERE
Owen Cote Oct. 1962 67 p refs
(NASA Contract NAS5-215)
(NASA CR-52751; GCA TR-62-12-N) OTS: $6.60 ph, $2.21 mf

Photographic sequences of rocket-produced sodium vapor trails, illuminated by resonant scattering of twilight solar radiation, are available for fourteen twilights in the period November 1950 to June 1962. The radial growth of the luminous cloud image at 112 km is explained by molecular diffusion with a diffusion coefficient equal to 6.8×10^6 cm^2/sec. Below this height, evidence in the 100- to 108-km region indicates an accelerated cloud growth for diffusion times greater than 35 seconds; the variance of the integrated line-of-sight distribution of sodium is proportional to t^2. The association of the accelerated growth of the trail after 35 seconds with preexisting atmospheric turbulence is unambiguous only if the effect of turbulence created by the wake and in the jet release of the vapor does not accelerate molecular diffusion, or interact with and remove energy from the large-scale strain field of the atmosphere, and if the large-scale divergence in combination with molecular diffusion is too small to account for the measured growth of the trail. Author

N64-11324* Chicago U., Ill.
THE FORMATION OF MID-LATITUDE SPORADIC-E LAYERS
C. O. Hines [1963] 4 p refs Submitted for publication
(NASA NsG-467)
(NASA CR-52564) OTS: $1.10 ph, $0.80

It is pointed out that a reinterpretation is required of data dealing with the detection of sporadic-E layers and wind shears at heights of 95 to 110 km. The phenomenon in concern is positive west-east shear which occurs when the eastward component of the wind increases with height. Whitehead (1961) concluded that wind shear, in combination with the geomagnetic field, will tend to produce an E layer near a maximum positive west-east shear, and its was correctly inferred by Rosenberg, Edwards, and Wright that the same analysis would yield a reduction of ionization at a level of maximum positive west-east shear. Data obtained by Whitehead (1961) should be reinterpreted because of the deletion of a minus sign in equation (2) of Whitehead's publication (1961). C.L.W.

N64-11350 Joint Publications Research Service, Washington, D.C.
NEW ACHIEVEMENTS IN THE USE OF AERIAL PHOTOGRAPHY FOR THE GEOGRAPHIC STUDY OF THE TERRAIN
L. M. Gol'dman 27 May 1963 8 p refs Transl. into ENGLISH of an article from the Publ. "Ispol'zovaniye topograficheskikh kartograficheskikh Issledovaniy", Moscow, 1958 p 31-36
(JPRS-19424; OTS-63-21924) OTS: $0.50

The problems of interpreting aerial photographs on colored multilayer and spectral-zonal aerial films, and the use of aerial cameras with short-focal-length objective lenses for the photography of flat, treeless areas, are discussed. It is concluded that, for economic effectiveness, speed, and accuracy, the user must employ this method of obtaining topographic maps and that the maps so obtained are more accurate when a radio altimeter is used in conjunction with the photographic camera. D.E.R.

N64-11378* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRESS DIFFERENCES AND THE REFERENCE ELLIPSOID
John A. O'Keefe and William M. Kaula Repr. from Sci., v. 142, no. 3590, 18 Oct. 1963 p 382 refs
(NASA RP-88)

The more recent theories on stress differences as the cause of the flattening of the earth are examined, and rejected for a variety of reasons. It is felt that firmer mathematical models and more extensive data, especially more widespread gravimetry, are needed before a good correlation can be shown. J.E.T.

N64-11395 Ohio State U., Columbus
INTERPOLATION AND PREDICTION OF POINT GRAVITY ANOMALIES
H. Moritz Repr. from the Ann. Acad. Sci. Fennicae, Ser. A, III, Geologica-Geographica (Helsinki) no. 69, 1963 35 p refs

A systematic general treatment of statistical interpolation and prediction is presented, in which the methods of geometric interpolation, representation, zero anomaly, and statistical least-squares prediction appear as special cases. A general formula for accuracy can be applied to all these cases, enabling their comparison, and determining their range of applicability. D.E.R.

N64-11418 Joint Publications Research Service, Washington, D.C.
AEROLOGICAL RESEARCH ON THE VARIABILITY OF THE REFRACTION COEFFICIENT OF THE ATMOSPHERE FOR ULTRASHORT RADIO WAVES
L. A. Pakhomov et al 10 Dec. 1963 107 p refs Transl. into ENGLISH of chapters 1 and 2 of a book "Aerologicheskiye issledovaniya izmenchivosti koeffitsienta prelomleniya atmosfery dlya ul'trakorotkikh radiovoln" Moscow, 1960 p 3-59
(JPRS-22198; OTS-63-41323) OTS: $2.50

The book is devoted to an analysis of aerological methods and instruments used for the measurement of meteorological elements, which determine the refractive index of the atmosphere for UHF radio waves, and also to a study of the time and space variations in the refractive index. Author

N64-11431 Joint Publications Research Service, Washington, D.C.
THE EIGHTH GEOPHYSICAL SYMPOSIUM
Andras Szentesi 8 Jul. 1963 7 p refs Transl. into ENGLISH of an article from Geodezia es Kartografia (Budapest), v. 15, no. 1 p 62-63
(JPRS-20051; OTS-63-31220) OTS: $0.50

Topics covered include: (1) the heat distribution processes within the earth, and terrestrial heat flux; (2) regional values of the geothermic depth gradients in the Carpathian basin; (3) the natural low-frequency electromagnetic energy source; (4) seismic activity in Germany; (5) sound phenomena originating near the surface and associated with earthquakes; (6) the measurement of earthquakes; (7) the problems of applied geophysics; (8) the magnetic survey of Germany; (9) the measurement of terrestrial currents; (10) directional current field geoelectric processes; (11) theory and application of equivalent synthetic earth networks in electric core sampling, and the importance of the equivalence matrix; (12) very deep geoelectric prospecting in Hungary; and (13) the evaluation of subsequent reflection and refraction arrivals. D.E.R.

13 HEAT TRANSFER AND THERMODYNAMICS

Includes ablation; cooling; heating; and other thermal effects. *For aerothermodynamics see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 03 Aerodynamics of Wings, Rotors, and Control Surfaces. *For combustion see*: 26 Propellants and Combustion. *For related information see*: 11 Fluid Mechanics.

N64-10673 Joint Publications Research Service, Washington, D.C.

COMPARATIVE BRITTLENESS OF HEAT-RESISTANT COMPOUNDS

I. N. Frantsevich and A. N. Pilyankevich (Inst. of Metal Ceramics and Special Alloys, AN USSR) *In its* Works on Heat-Resisting Materials, USSR 1960 p 61–79 refs (See N64-10669 02-01) OTS: $2.75

Qualitative (construction of microbrittleness curves) and quantitative (microfractographic) investigations of the brittleness of refractory metalloid compounds were conducted. Results are as follows: (1) The statistical curves of microbrittleness distinctly illustrate the difference in the microbrittleness of the different compounds investigated. Considering the most appropriate comparison of microplasticity indices at a load of 20 grams, the following series of the examined compounds can be recorded according to decreasing brittleness: Si, TiN, NbB_2, SiC, ZrC, CrB_2, Cr_3C_2, TiC. This series takes the plasticity of viscosity, determined by Palmquist, as a criterion. (2) Investigation of the different refractory compounds of titanium (carbide, boride, nitride, and silicide) shows that the increase in brittleness runs in the order of $TiSi_2$, TiC, TiB_2, TiN. (3) Quantitative data on the comparatively large degree of microbrittleness of TiC and CrB_2 and the correlated qualitative data confirm the very good hot compressibility and the relative high resistivity to thermal shocks. The correlative qualitative and quantitative data also coincide for Si, NbB_2, TiN, etc. I.v.L.

N64-10919* Conductron Corp., Ann Arbor, Mich.

PRINCIPLES OF RADIOMETRY: PRESENT STATE-OF-THE-ART

Weston E. Vivian *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 90-102 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

Critical instrumentation problems that may arise in measuring atmospheric radiation with microwave radiometers in satellites are discussed. These problems include: (1) the sensitivity of the radiometer; (2) the spatial coverage and resolution of the scanned area; (3) wavelength, aspect angle, and polarization scan; (4) temperature accuracy; (5) the performance of the receiver components; and (6) the determination of applicable antennas. I.v.L.

N64-10920* Conductron Corp., Ann Arbor, Mich.

SOME COMMENTS ON THE MEASUREMENT OF SEA STATE

Weston E. Vivian *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 103-109 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

A technique for detecting the sea state from a satellite by means of microwave radiometry is discussed. This technique is of interest because it promises to be effective when the sea is obscured, at optical wavelengths, by clouds. The technique includes: (1) an examination of the thermal microwave radiation received at a satellite as a function of the polarization of the receiving antenna and (2) a consideration of what changes occur if the sea is turbulent and rough, rather than calm and smooth. I.v.L.

N64-10938* National Bureau of Standards, Washington, D.C.

PITFALLS IN THERMAL EMISSION STUDIES

William N. Harrison *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 3-10 refs (See N64-10937 02-01) GPO: $3.50

Attention is called to several pitfalls that often beset investigators who make thermal emittance studies. The pitfalls mentioned include the following: (1) conflicting meanings of several frequently used terms as found in the literature, each meaning having authoritative sponsorship; (2) incomplete and hence potentially misleading descriptions of specimens on which reported data are based; (3) reference to emissivity or remittance as a property of a surface rather than a volume property (influenced by the surface); (4) occasional omission of diffuse reflection from analyses of the optical properties of inhomogeneous bodies; (5) failure to observe the restrictions upon conditions that are required for validity of basic equations; (6) uncertainties as to the effective temperature, peculiar to specimens having low absorption indices; and (7) lack of suitable physical standards. Several suggestions are made for avoiding or minimizing the consequences of the pitfalls discussed. Author

N64-10939* National Bureau of Standards, Washington, D.C.

TEMPERATURE MEASUREMENTS BELOW 1000°K [Abstract]

John L. Riddle *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 11–12 (See N64-10937 02-01) GPO: $3.50

Values on the International Practical Kelvin Scale (IPKS) are, by definition, equal to the corresponding values on the International Practical Temperature Scale (IPTS) plus 273.15 degrees. The IPTS is realized from −182.97° C (90.18° K) to 630.5° C (903.65° K) by means of platinum resistance thermometers which meet certain requirements of purity and construction and which have been calibrated at four defining fixed points to determine the four coefficients in the specified formula, $R_t = R_o\ [1 + At + Bt^2 + Ct^3\ (t - 100)]$, where, by definition $C = 0$ for $t > 0$. The four defining fixed points and their assigned values of temperature are the triple point of water (+0.01° C), and the normal boiling points of oxygen (−182.97° C), water (100° C), and sulfur (444.6° C). Because of difficulties in realizing a reproducible equilibrium at the sulfur point it was recommended in 1960 that the freezing point of zinc (419.505° C) be used in place of the sulfur point. Below the lower limit of the IPTS (−182.97° C or 90.18° K) the NBS-55 scale, which extends down to 10° K, may be used. Calibration on this scale is obtained by comparison with a small group of reference platinum-resistance thermometers maintained at the National Bureau of Standards. Author

N64-10940* National Bureau of Standards, Washington, D.C.

THERMOCOUPLE AND RADIATION THERMOMETRY ABOVE 900°K

Henry J. Kostkowski and George W. Burns *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 13-30 refs (See N64-10937 02-01) GPO: $3.50

This paper reviews the principles of thermocouple and radiation thermometry above 900° K, the present day precision and accuracy, and the commercial instruments currently available. The International Practical Temperature Scale and the Thermodynamic Kelvin Temperature Scale are briefly described. With regard to thermocouples, the presentation is confined to the more generally accepted base, noble, and refractory metal types. Characteristics such as temperature range, stability, and environmental limitations will be emphasized. The optical pyrometry section includes a discussion of emittance corrections, recommendations for using visual optical pyrometers, and the status of

photoelectric optical pyrometers. Finally, two-color, three-color, and total-radiation pyrometers are discussed, primarily to show that, in spite of the recent interest in these instruments, they are not generally as suitable for measuring temperature as optical (single-color) pyrometers.
Author

N64-10941* National Bureau of Standards, Boulder, Colo.
THERMAL RADIATION PROPERTIES OF SOLIDS AT LOW TEMPERATURES
Robert J. Corruccini *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 33-37 refs (See N64-10937 02-01) GPO: $3.50

This paper provides introductory remarks for the symposium session on thermal radiation properties of solids in the range 0° to 200° K. A qualitative description is given of that part of the theory that is unique to low temperatures, after which experimental methods appropriate to low temperatures and present applications of low temperature data are sketched.
Author

N64-10942* Aeronautical Systems Div., Wright-Patterson AFB, Ohio
AN APPARATUS FOR MEASURING TOTAL HEMISPHERICAL EMITTANCE BETWEEN AMBIENT AND LIQUID NITROGEN TEMPERATURES
G. L. Haury *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 51–54 refs (See N64-10937 02-01) GPO: $3.50

An apparatus was designed, fabricated, and calibrated for measuring the mean total hemispherical emittance of solid materials in the temperature range between ambient and liquid nitrogen temperatures. The apparatus is particularly adapted for accommodating large, flat samples instead of cylindrical ones. A description of the apparatus, together with appropriate operational details is presented, in addition to some preliminary data on copper and three samples of aluminum foil. The accuracy of the apparatus, based on these data, has been determined to be within ±2.5%.
Author

N64-10943* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REQUIREMENTS FOR EMITTANCE MEASUREMENTS OF THERMAL CONTROL SURFACES OF SPACECRAFT
Gerhard B. Heller *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 69–74 refs (See N64-10937 02-01) GPO: $3.50

This paper is an introduction to the discussion of measuring techniques for the emittance of spacecraft surfaces. It discusses the required physical properties and their ranges for the thermal design of spacecraft. The parameters affecting thermal equilibrium are discussed; the emittances of the spacecraft surfaces in various wavelength regions are important physical properties for the thermal design. The various types and properties of radiative fluxes to and from the spacecraft are summarized. From this, the required ranges are derived for the determination of emittance and transparency of surfaces. Requirements are given for one type of surface important to the Manned Lunar Landing Project.
Author

N64-10944* Lockheed Missiles and Space Co., Palo Alto, Calif.
INSPECTION TOOLS FOR MEASUREMENT OF THE RADIATION PROPERTIES OF SATELLITE TEMPERATURE CONTROL SURFACES
R. E. Gaumer, G. F. Hohnstreiter, and G. F. Vanderschmidt (Lion Research Corp., Cambridge, Mass.) *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 117–126 refs (See N64-10937 02-01) GPO: $3.50

A semiportable emissometer for making measurements of room temperature emittance and of spectral absorptivity of a surface over the solar range is described. The emissometer consists of a cooled and evacuated chamber with an 8-junction bismuth–silver thermopile, one surface of which is irradiated by the sample whose emittance is to be measured. The apparatus is designed for production-line and launch-site use as a check for satellite thermal-control surfaces.
E.W.

N64-10945* Lockheed Missiles and Space Co., Palo Alto, Calif.
CALORIMETRIC DETERMINATION OF INFRARED EMITTANCE AND THE α_s/ϵ RATIO
R. E. Gaumer and J. V. Stewart *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 127–133 refs (See N64-10937 02-01) GPO: $3.50

The ratio of solar absorptance to infrared emittance of a sample material is measured using a calorimetric device. The sample is suspended in a blackened copper, liquid-nitrogen-cooled chamber, enclosed in a stainless-steel outer chamber in which a vacuum of 1×10^{-6} mm Hg is maintained. The sample is irradiated on both sides, and the temperature change is recorded. The data output is sample equilibrium temperature, from which the absorptance–emittance ratio and the emittance can be calculated.
E.W.

N64-10947* Grumman Aircraft Engineering Corp., Bethpage, N.Y.
HEATED CAVITY REFLECTOMETER MODIFICATIONS
R. J. Hembach, L. Hemmerdinger, and A. J. Katz *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 153–167 refs (See N64-10937 02-01) GPO: $3.50

The heated cavity reflectometer is the most practical device available for thermal reflectance measurements of opaque surfaces. Its application, however, is based upon the reciprocity of incident and reflected radiation. As a result, it is extremely sensitive to any deviations from a true blackbody cavity. The greatest errors come from nonuniform temperature, and nonhomogeneous field of view. This report describes the modifications to an upright hohlraum reflectometer to correct the errors inherent in its original design. Data taken on the redesigned device are compared with those of the original design, demonstrating the improvements accomplished.
Author

N64-10948* Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.
HEMISPHERIC SPECTRAL REFLECTANCE OF SOLIDS
W. E. Martin *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 183–192 refs (See N64-10937 02-01) GPO: $3.50

Measurements of the spectral reflectance of nontransparent media from 350 to 2500 mμ have been made by irradiating a sample with a hemispherical diffuse source, and measuring the reflected flux at an angle of 45° to the normal. The diffuse source consists of three coincident hemispheres. An outer hemisphere mounts 96 incandescent lamps pointed radially inward. A second hemisphere shades the base of each lamp and reflects diffusely the radiance of these lamps. The inner hemisphere is a light-diffuser 5 in. in diameter, made from translucent grit-blasted glass. The base plane of the coincident hemispheres is a disk coated with electrolytic aluminum having a reflectance of 0.7 to 0.9 through the spectral range of measurement. The base plane provides a virtual image of the innermost hemisphere. A sample is placed at a port located in the base plane at the origin of the coincident hemispheres, and therefore is irradiated as though it were surrounded by a sphere of uniform wall brightness. An area of the sample (viewed at 45°) is projected into the entrance slit of the monochromator, and the flux received is a measure of the sample reflectance. The absolute reflectance is determined by the relative radiant intensities from the sample and from a standard reflector. Both a diffuse standard and a specular standard have been used. Author

N64-10952* Naval Ordnance Lab., Corona, Calif.

SPECTRAL EMITTANCE MEASUREMENTS FROM 40°C TO 200°C

Donald L. Stierwalt *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 231–236 (See N64-10937 02-01) GPO: $3.50

Instrumentation has been developed for measuring the spectral emittance of both opaque and transparent materials from 40° to 200° C in the 2 μ to 25 μ spectral region. The technique consists of measuring the radiation from a heated sample and comparing with that from a blackbody reference source. A Beckman IR–3 spectrophotometer has been modified for this purpose. By programing the IR–3 with a blackbody at the same temperature as the sample, the spectral emittance is read out directly on the recorder chart. Spectral emittance measurements have been made on germanium, silicon, cadmium sulfide, Irtran I, Irtran II, and several other transparent and opaque materials. Curves of spectral emittance for a selection of these materials at several temperatures are presented. Author

N64-10953* General Electric Co., King of Prussia, Pa. Missile and Space Div.

RADIATIVE PROPERTY MEASUREMENTS OF THERMAL CONTROL COATINGS FOR SPACECRAFT

M. A. Turner *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 253–260 refs (See N64-10937 02-01) GPO: $3.50

The major problems in establishing the reliability of thermal control coatings in spacecraft are the measurement of their radiative properties—solar absorptance, emittance and transmittance, including their dependence upon angle of incidence—and the prediction of the effect of preflight, ascent and orbital environments upon these properties. Spectrophotometers which measure reflectance yield the greatest accuracy for materials having reflectances near zero. Surface emission and other extraneous sources degrade the accuracy of the emittance determination for such specimens. However, these instruments yield large discrepancies in determining the values of highly specular surfaces having very low emittance or solar absorptance. The properties of such surfaces are measured with greater precision by calorimetric methods in a model solar simulator. In long-lived vehicles, such as the astrophysical communications and weather satellites, degradation of the radiative properties, usually in the form of darkening of white coats and clear films, comes about principally as a result of preflight smudging, solar ultraviolet and long term Van Allen belt irradiations. The uncertainties in predicting these effects are greatest for surfaces having low values of solar absorptance and emittance or high transmittances. Author

N64-10954* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

LOW-TEMPERATURE EMITTANCE APPARATUS

Robert W. Ward and John F. Mc Donough *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 261–267 refs (See N64-10937 02-01) GPO: $3.50

This paper describes a method of emittance measurement for very thin sheet materials in the temperature range of 273° to 373° K. A mathematical expression is derived for the emittance of the innermost of two concentric cylinders, and simplifying assumptions are made to reduce this relationship to the usual equation for a heated "wire in vacuo." The error due to the simplification is discussed. The apparatus and instrumentation are described and some results are presented. Author

N64-10959* Pratt and Whitney Aircraft, East Hartford, Conn.

MEASUREMENT OF SPECTRAL NORMAL EMITTANCE OF MATERIALS UNDER SIMULATED SPACECRAFT POWER-PLANT OPERATING CONDITIONS

R. D. House, G. J. Lyons, and W. H. Askwyth *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 343–355 refs (See N64-10937 02-01) GPO: $3.50

An apparatus was designed and constructed to determine spectral normal emittance of materials in an environment closely simulating the vacuum of space. The apparatus is capable of measuring spectral emittance of structural materials or coatings over a wavelength range accounting for the major portion of blackbody energy at the temperature at which these measurements are made. The method used is the same as that used by Larrabee and by DeVos, in which comparison is made of the radiant intensity normal from a specimen tube surface to that of a small "blackbody hole" drilled in the tube wall. The ratio of these intensities, at a given wavelength, is a very close approximation to the spectral normal emittance of the specimen surface. A comparison of the data obtained in the apparatus discussed in this paper to those obtained by Larrabee and by DeVos indicates close agreement. Author

N64-10960* Michigan U., Ann Arbor

THE MEASUREMENT OF TOTAL NORMAL EMITTANCE OF THREE NUCLEAR REACTOR MATERIALS

T. Limperis, D. M. Szeles, and W. L. Wolfe *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 357–364 refs (See N64-10937 02-01) GPO: $3.50

This study was conducted to determine the total normal emittance, at different temperatures, of 304 stainless steel, A-7 carbon steel, and borated graphite materials for nuclear reactor use. A Barnes radiometer was used to establish a comparison measurement of the ratio of fluxes from the graybody sample and an adjustable blackbody. The data consist of a signal voltage dependent on irradiance level, from which the emittance of the sample can be computed. E.W.

N64-10961* Oak Ridge National Lab., Tenn.

THE TOTAL HEMISPHERICAL EMITTANCE OF PLATINUM, COLUMBIUM-1% ZIRCONIUM, AND POLISHED AND OXIDIZED INOR-8 IN THE RANGE 100° TO 1200°C

D. L. Mc Elroy and T. G. Kollie *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 365–37 refs (See N64-10937 02-01) GPO: $3.50

Equipment was developed for measuring the temperature dependence of the total hemispherical emittance (E_t:T) of metal and alloy strips to 1200° C using direct heating in a constant-temperature, blackbody vacuum chamber. Precise specimen dimensions and thermocouple positioning are requisite to the method, and the techniques developed to accomplish these are described. If the systematic errors of this equipment are evaluated, the E_t measurement accuracy is ±2.7% and the reproducibility is ±0.5%. Increased E_t:T occurred with increasing surface roughness and oxidation. Results are presented which show the effects of specimen reaction with the measuring environment and specimen-oxide reactions. The electrical resistivity of the specimen was obtained from the data taken in an E_t determination. The applicability of the method for determining E_t:T on a cylindrical specimen was demonstrated. Author

N64-10962* Pratt and Whitney Aircraft, East Hartford, Conn.

MEASUREMENT OF TOTAL HEMISPHERICAL EMITTANCE OF STRUCTURAL MATERIALS AND COATINGS UNDER SIMULATED SPACECRAFT CONDITIONS

G. Mikk and W. H. Askwyth *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 381–391 refs (See N64-10937 02-01) GPO: $3.50

Several test rigs were designed and constructed to measure total hemispherical emittance, over a wide range of temperatures, under conditions which simulate the vacuum of space. The method used in all of the rigs is to compare the electrical power dissipated from an isothermal test section of a resistance-heated specimen to the total emissive power of a blackbody operating at the specimen temperature. Two types of tests are conducted in these rigs—determination of total hemispherical emittance as a function of temperature from approximately 200° to 2200° F, and determination of total hemispherical emittance as a function of time at fixed elevated temperatures (endurance tests). Specimens used for these tests were usually in the form of coated metal strips or coated thin-walled metal tubes. Some typical data presented are comparisons of results of various investigators, and of results obtained in the various rigs used in these tests. Author

N64-10964* Boeing Co., Seattle, Wash.

A VERY RAPID 3000° F TECHNIQUE FOR MEASURING EMITTANCE OF OPAQUE SOLID MATERIALS

R. J. Evans, W. A. Clayton, and M. Fries *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 483–488 (See N64-10937 02-01) GPO: $3.50

This paper presents a rapid, total normal emittance measurement technique useful for comparative tests. The heat source is a 10-kw tungsten-filament lamp whose energy is focused on the specimens with two 36-inch parabolic mirrors. The method described is useful between 1000° to 3000° F with all tests conducted in air. Accuracy depends on surface temperature measurements, with an accuracy of +5% and −10% when the thermocouples are used, and an accuracy which depends on the deviation of the specimen from a gray body when an optical pyrometer is used. Author

N64-10965* Aeronca Mfg. Corp., Middletown, Ohio

EMITTANCE MEASUREMENT CAPABILITY FOR TEMPERATURES UP TO 3000° F

A. S. Kjelby *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 499–503 (See N64-10937 02-01) GPO: $3.50
(Contract AF 33(616)7050)
(ASD-TR-61-706, Vol. 2)

The emittance of a reentry-vehicle heat shield plays an important role in maintaining low substructure temperatures. State-of-the-art literature does not furnish sufficient data for the radiation properties of ceramics in the temperature range realized during reentry. In order to provide these data it was necessary to design and construct a special apparatus capable of measuring emittances up to 3000° F. The method of determination of the total hemispherical emittance by comparison with a blackbody is the basis of the technique herein employed. If the temperatures and the areas of the unknown surface and the blackbody are made equal, the method becomes simply the determination of the ratio of the rates of emission. Author

N64-10966* North American Aviation, Inc., Los Angeles, Calif.

EVALUATION OF THERMAL RADIATION AT HIGH TEMPERATURES

S. Konopken and R. Klemm *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 505–513 refs (See N64-10937 02-01) GPO: $3.50

Because many materials change in radiation characteristics with increasing temperature, it has become increasingly important to determine emittance values directly instead of by the comparatively easier method of computing emittance values from reflectance data. This is particularly true if the material is partially transparent to radiation. A new apparatus is being built to extend the capability for evaluating emittance from the currently available 1500° F to at least 4000° F. The technique being applied is to rotate specimens in a high-temperature furnace which is also utilized as a blackbody radiation source. The analytical techniques used to establish speed of rotation, field of view, and other design problems are discussed A review of other radiation test equipment is also presented. Author

N64-10967* Solar, San Diego, Calif.

EMITTANCE MEASUREMENTS OF REFRACTORY OXIDE COATINGS UP TO 2900° K

V. S. Moore, A. R. Stetson, and A. G. Metcalfe *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 527–533 (See N64-10937 02-01) GPO: $3.50
(Contract AF 33(616)-8497)

The hot-filament method for the measurement of total hemispherical emittance has been adapted for ceramic coatings. The radiated energy per unit area is measured simply and accurately by potential probes in the uniform temperature region of the filament. Several methods have been examined to determine the true surface temperature. An approximate solution has been used in which it has been assumed that the coating is a gray body. In this case, the true surface temperature and emittance are determined from the solution of simultaneous equations derived from the Wien and Stefan–Boltzmann Laws. A more accurate method is based on the use of the hot filament as a resistance thermometer. For opaque, nonconductive, uniform coatings, it can be shown that extrapolation of this resistance temperature to zero thickness coatings for constant energy radiated per unit area gives the true surface temperature for this density of radiation. Author

N64-10968* Southern Research Inst., Birmingham, Ala.

SOME PROBLEMS IN EMITTANCE MEASUREMENTS AT THE HIGHER TEMPERATURES AND SURFACE CHARACTERIZATION

C. D. Pears *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 541–551 refs (See N64-10937 02-01) GPO: $3.50
(Contract AF 33(616)-7319)

The emittances of several refractory materials were determined at temperatures from 800° to 5000° F with an instrument in which the radiance of a specimen was compared with the radiance of a blackbody cavity at the same temperature. A thermopile type of detector was used. The emittance was found to be related to the structure of the material at the higher temperatures. Small disk-shaped specimens were placed on similar disks of tantalum or tungsten and heated inductively to a steady-state temperature. The surface temperature of the specimen was determined by thermocouples to 2500° F and by optical pyrometry to 5000° F assuming graybody distribution at the wavelength of the optical pyrometer

(0.665μ). For the thermocouples, several methods of attachment were used depending on the nature of the structure of the specimen. For the temperature determinations by optical pyrometry, a method of iterating between the readings of the optical pyrometer and the total radiation detector was developed for the computer to permit the solution of true temperature. Author

N64-10969* National Bureau of Standards, Washington, D.C.
PERIODIC HEAT FLOW IN A HOLLOW CYLINDER ROTATING IN A FURNACE WITH A VIEWING PORT
B. A. Peavy and A. G. Eubanks *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 553–563 refs (See N64-10937 02-01) GPO: $3.50

A rotating-specimen furnace has been designed and constructed for use in determining the thermal emittance, both spectral and total, of materials in the temperature range 1300° to 1800° K. In this apparatus, a hollow cylindrical specimen is rotated at constant speed in a concentric cylindrical furnace with heated walls, and the radiant flux from the specimen surface is measured as it passes a small viewing port. An analytical method is given for estimating the surface temperature of the specimen as a function of rotation speed, thermal properties of the specimen material, and system geometry. The apparatus is described, and data obtained with the specimen rotating at slow speeds are compared with values predicted by the analytical method. Author

N64-11009 Joint Publications Research Service, Washington, D.C.
EQUIPMENT FOR DETERMINING THE KINETICS OF VAPORIZATION AND THE VAPOR TENSION OF METAL POWDERS
I. M. Fedorchenko and Yu. B. Ermolovich *In its* Soviet Res. in Powder Metal Mater. 28 Feb. 1963 p 5–9 refs (See N64-11007 02-01)

A method for determining the kinetics of vaporization and the vapor tension of metal powders was developed. A description is given of the experimental equipment used in the method and its operation. R.T.K.

N64-11141 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
METHODS AND CERTAIN RESULTS OF THE MEASUREMENT OF THE CRITICAL LOAD DURING THE TRANSITION FROM FILM TO BUBBLE BOILING
B. S. Petukhov and S. A. Kovalev (Moscow Inst. of Power Eng.) *In its* Heat Power Eng. 25 Jan. 1963 p 10–24 refs (See N64-11139 02-01)

The measurement of the second critical load during the boiling of a liquid is considered, the results of an experimental study are presented, and a method of calculating the stability of the film and bubble regimes of boiling is proposed. Author

N64-11142 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
METHODS OF GENERALIZING EXPERIMENTAL DATA ON CONVECTIVE HEAT TRANSFER DURING THE MOVEMENT OF GAS IN THE INITIAL REGION OF A CONDUIT
S. I. Kosterin, A. I. Leont'yev, and V. K. Fedorov *In its* Heat Power Eng. 25 Jan. 1963 p 25–33 refs (See N64-11139 02-01)

A new method for generalizing the experimental data on convective heat transfer in the turbulent boundary layer of a gas is proposed. A universal law of heat transfer for the turbulent boundary layer of a compressed gas is derived. Author

N64-11191 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ON THE HEAT CAPACITIES OF THIN FILMS AND LITTLE RODS AT LOW TEMPERATURES
I. M. Lifshits 9 Aug. 1963 7 p refs Transl. into ENGLISH from Zh. Eksperim. i Teor. Fiz. (Moscow), no. 22, 1952 p 471–474
(FTD-TT-63-517/1+2; AD-420846)

Expressions are developed for determining the heat capacities of thin films and thin rods (needles) at low temperatures. The expression developed for thin films is $C = 2\alpha k/\zeta^2\ T/\theta$, and for thin rods is $C = \gamma(T/\theta)^{1/3}$. Where α and k are constants of the material, ζ = the thickness of the film, θ = the Debye temperature of the film, R = the radius of the rod, and $r = 2k/R$. P.V.E.

N64-11193* National Aeronautics and Space Administration, Washington, D.C.
HEAT TRANSFER FROM FIN-TUBE RADIATORS INCLUDING LONGITUDINAL HEAT CONDUCTION AND RADIANT INTERCHANGE BETWEEN LONGITUDINALLY NONISOTHERMAL FINITE SURFACES
E. M. Sparrow, V. K. Jonsson, and W. J. Minkowycz (Minnesota U.) Dec. 1963 27 p refs
(NASA TN D-2077) OTS: $0.75

It is shown that longitudinal conduction is negligible for practical values of the governing parameters appropriate to space-vehicle power systems. It is also demonstrated that the radiant interchange can be calculated with sufficient accuracy by assuming longitudinally isothermal surfaces that are essentially infinite in length. These conclusions indicate that the problem can be treated in a quasi-two-dimensional manner. Results based on a quasi-two-dimensional model can be generalized to the case of a longitudinally varying temperature by a step-by-step method which is described. Author

N64-11241 Weapons Research Establishment (Australia)
ABLATION OF INORGANIC FIBRE REINFORCED PLASTICS IN A ROCKET JET
T. E. Richards and J. R. Baxter Sep. 1963 32 p refs
(CPD-61)

The rates of ablation of a range of experimental fiber-reinforced plastic materials when exposed in a rocket jet have been measured. The fibers used were glass, asbestos, "fiberfrax" (an aluminosilicate fiber) and "refrasil" (a 96% silica fiber), and they were bonded with either a phenolic or silicone resin. In the absence of particulate material in the jet, refrasil and fiberfrax materials were ablated at a markedly lower rate than glass or asbestos materials. With particulate material in the jet the ablation rate of all the materials tested was increased. Glass and fiberfrax materials were ablated at a much lower rate than the asbestos and refrasil materials; refrasil materials were particularly rapidly ablated. Results are explained in terms of the properties of the reinforcing fiber and resin, and by the theory that a molten layer on the surface has a large effect in reducing particle impact erosion. Author

N64-11261 European Atomic Energy Community, Brussels (Belgium)
DETERMINATION OF THERMAL CONDUCTIVITY IN A HOLLOW CYLINDER BY SOLVING THE FOURIER DIFFERENTIAL EQUATION FOR THE THERMAL CONDUCTIVITY [BESTIMMUNG DER TEMPERATURLEITFAHIGKEIT IN EINEM HOHLZYLINDER MITTELS DER LOSUNG DER FOURIER'SCHEN DIFFERENTIALGLEICHUNG DER WARMELEITUNG]

G. Di Cola and R. F. Gloden Joint Nuclear Res. Center, Ispra Establishment (Italy). Scientific Data Proc. Center, Sept. 1963 30 p refs In GERMAN; ENGLISH abstract
(EUR 377.d) Available from Belgian American Bank and Trust Co. N.Y., account No. 121.86: 50 BF

To determine experimentally the thermal diffusivity of a material, a tube is heated inside by an instantaneous impulse of heat. A determination is made of the time taken for the temperature on the external surface of the tube to reach half of its maximum value. Departing from the heat equation applied to an insulated hollow cylinder, through the solution of an eigenvalue problem, an expression is obtained for the temperature in the form of a series of Bessel functions. A plot is made of the temperature as function of a variable τ proportional to the product of the diffusivity with the time. Knowing the value of τ corresponding to half the value of the maximum temperature, and knowing the time after which this temperature is reached on the external surface of the cylinder, it is possible to calculate the diffusivity. Author

N64-11344 Chance Vought Corp., Dallas, Tex. Astronautics Div.
THE OPTIMIZATION OF AN ACTIVELY COOLED HEAT SHIELD SYSTEM
J. K. Haviland 17 Jul. 1963 18 p refs
(Contract AF 33(616)-7829)
(Rept. 00.256)

The application of Thermosorb, a high-water-content expendable heat sink, has been studied. The particular system of interest has a radiation cooled surface separated by a layer of insulation, and by a low emissivity vapor barrier, from the Thermosorb. By assuming that the vapor barrier and the Thermosorb are at equal temperatures, and by treating the system as quasi-steady, it can be shown that the optimum system contains equal weights of insulation and water. This report presents the results of a more detailed study, in which the temperature difference between the vapor barrier and the Thermosorb is correctly accounted for. A new dimensionless parameter is introduced, and it is shown that the optimum ratio between water and insulation is a function of this parameter. Curves covering the complete range of solution are presented. Author

14 HUMAN BEHAVIOR

Includes crew training and evaluation; piloting; and psychological factors. *For simulators see*: 10 Facilities, Research and Support. *For related information see*: 16 Life Sciences.

N64-10703 Joint Publications Research Service, Washington, D.C.
SOME HUMAN PHYSIOLOGICAL REACTIONS UNDER CONDITIONS OF ALTERNATING OVERLOADS AND WEIGHTLESSNESS
I. I. Kas'yan *In its* Transl. from Izvest. Akad. Nauk SSSR (News of the Acad. of Sci. USSR) [Moscow] no. 6, 1962 12 Feb. 1963 p 24–40 refs (See N64-10702 02-01)

Human physiological responses were studied on special airplanes which reproduced short-term weightlessness (up to 45 seconds) when carrying out parabolic flights. It was found that changes in the basic indices of the function of the cardiovascular and respiratory systems during alternating action of overloads and weightlessness were short termed and of a reversible character. Thus, upon the action of overloads up to 3.5 units, some regular reflex changes of cardiac activity were observed. Under the conditions of short-termed weightlessness, there was a tendency of the cardiovascular indices to return to the initial level. Individual peculiarities of human physiological response to the alternating influence of increased and decreased gravitation were determined. Author

N64-10852 Joint Publications Research Service, Washington, D.C.
MAN AND TECHNOLOGY
F. D. Gorbov 21 Nov. 1963 22 p ref Transl. into ENGLISH from Voprosy Psikhologii (Moscow), no. 4, 1963 p 153–158
(JPRS-21976; OTS-63-41191) OTS: $0.75

A review is presented of a book entitled "Man and Technology. Outlines of Engineering Psychology." P.V.E.

N64-10909* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PILOTED SIMULATOR STUDIES PERTAINING TO THE LOW-SPEED LONGITUDINAL HANDLING QUALITIES OF A SUPERSONIC TRANSPORT AIRPLANE
Richard S. Bray *In* Am. Inst. of Aeron. and Astronautics AIAA Simulation for Aerospace Flight Conf., a Vol. of Tech. Papers Presented 26–28 Aug. 1963 Columbus, Ohio [1963] p 35-43 (See N64-10908 02-01)

Factors considered in the tests included speed-thrust stability, static stability, control sensitivity, and cockpit location relative to the landing gear. This study of the approach and landing task was conducted with a fixed-cockpit simulator which provides the pilot with a realistic view of the runway during the concluding portion of the approach. Evaluations in terms of pilot opinion and measured landing performance are presented, and significant experiences with the simulation technique are discussed. Author

N64-11111* Douglas Aircraft Co., Inc., El Segundo, Calif.
HUMAN TRACKING PERFORMANCE UNDER TRANSVERSE ACCELERATIONS
L. G. Summers 28 Sep. 1962 76 p refs
(NASA Contract NASr-68)
(NASA CR-52718; LB-31116) OTS: $7.60 ph, $2.48 mf

Human performance was measured for control display parameters during positive and negative transverse accelerations ("eyeballs in" and "eyeballs out"). Five subjects were given a compensatory tracking task in pitch and roll using a two-axis side arm controller and a CRT attitude display with a moving horizon. Three acceleration levels were used, each consisting of a two-minute duration. Performance was measured by the integral of absolute error in both the pitch and roll axes. There was a decrement in performance in the pitch axis with increased acceleration but differences in the roll axis were shown only for one analysis model of two. No differences were recorded in performance due to direction of the acceleration. Aircraft dynamics affected performance but did not interact with acceleration. Visual error feedback, which averaged performance over a period of time, improved performance in pitch and degraded performance in roll. Author

N64-11131 Joint Publications Research Service, Washington, D.C.
HUMAN REACTIONS IN SIMULATED SPACE ENVIRONMENT

A. Zhigarev and A. Iordanskiy 28 Jun. 1963 6 p Transl. into ENGLISH of an article from Kommunist (Yerevan), 14 Jun. 1963 p 3
(JPRS-19953; OTS-63-31167) OTS: $0.50

A discussion is presented of the effect on man of a prolonged stay in an isolation cabin, in conditions of limited movement, and with little link to the outside world. R.T.K.

N64-11133 Joint Publications Research Service, Washington, D.C.
THE SOVIET COSMONAUTS
Ye. Petrov 10 Jul. 1963 26 p refs Transl. into ENGLISH of a portion of an article from Krasnaya Zvezda (Moscow), 16 Feb. and 16 and 22 Mar. 1962
(JPRS-20100; OTS-63-31243) OTS: $0.75

The role of the Soviet cosmonauts in designing their spacecraft and planning their missions is discussed, with a general description of the training program and the variety of tests to which they are subjected. D.E.R.

N64-11135 Joint Publications Research Service, Washington, D.C.
PSYCHOLOGY AND ASTRONAUTICS
Yu. Volynkin 15 Jul. 1963 17 p Transl. into ENGLISH of an article from Med Gazeta (USSR), 18 Jun. 1963 p 2ff
(JPRS 20171; OTS-63-31285) OTS: $0.50

A discussion is presented on the psychological and physiological effects on man of the unusual conditions encountered in spaceflight. The main problems in the engineering psychology of spaceflight are also examined. R.T.K.

N64-11137 Joint Publications Research Service, Washington, D.C.
VELOCITY, ACCELERATION, WEIGHTLESSNESS
P. K. Isakov and R. A. Stasevich 26 Jul. 1963 66 p refs Transl. into ENGLISH of chapters four and five of a book "Skorosti, Uskoreniya, Nevesomost'," Moscow, 1962 p 81–147
(JPRS-20345; OTS-63-31379) OTS: $1.75

The following topics on the effect of acceleration on the human body are presented: (1) how man perceives the change in the rate of movement, (2) the general effect of acceleration on the body, (3) on what the final result of the acceleration effect depends, and (4) methods of increasing resistance of the body to acceleration. The topics discussed in the chapter on weightlessness are: (1) physical conditions under which weightlessness occurs, (2) creation of weightlessness artificially, (3) the body and weightlessness, and (4) acceleration and weightlessness in spaceflights. R.T.K.

N64-11177 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th) Wright-Patterson AFB, Ohio
A METHODOLOGICAL APPROACH TO THE ANALYSIS AND AUTOMATIC HANDLING OF TASK INFORMATION FOR SYSTEMS IN THE CONCEPTUAL PHASE [Final Report]
Lawrence E. Reed, John P. Foley Jr., Ralph S. Graham, and Jonathan B. Hilgeman (Aeron. Systems Div.) Aug. 1963 126 p
(AMRL-TDR-63-78; AD-419018) OTS: $2.75

This report presents a technique for analyzing and processing task and task requirements data generated during the conceptual phase of system development. The technique includes: (1) a category system for organizing, classifying, and coding task information; (2) a task analysis format for recording and coding task descriptions and task requirements; and (3) computer update and retrieval programs. Task requirement data appearing in documents resulting from the Air Force Study Requirement program are analyzed and used for testing the technique on an actual personnel training problem. The test program indicates that the technique can be used to assist human factors specialists to isolate and process task and task requirements associated with advanced systems for making personnel, training, and training equipment recommendations. Author

N64-11260* California U., Los Angeles
STATUS REPORT ON DEVELOPMENT OF A HIGH-SPEED HIGH-INTENSITY MOLECULAR BEAM
Eldon L. Knuth Jul. 1963 79 p refs
(NASA Grant NsG-237-62)
(NASA CR-52865; Rept. 63-30) OTS: $7.60 ph, $2.57 mf

Using an arc-heated source and a hypersonic jet, molecular energies exceeding 1 ev and beam intensities of the order of 10^{16} molecules/cm^{2}sec are anticipated. A two-disk beam chopper and speed selector provides a means for analyzing the speed distribution in the generated beam, for chopping the beam into bursts of nearly monoenergetic molecules suitable for scattering studies using the time-of-flight technique, and for modulating the beam in order to facilitate detection. A through-flow ionization detector possesses the versatility required for scattering studies using the time-of-flight technique. A sorption pump and a turbopump serve as central components of alternative pumping systems for the collimating chamber. All system components have been fabricated; an arc-heated beam was generated and detected. Author

N64-11396* Naval School of Aviation Medicine, Pensacola, Fla.
ROTARY AUTOKINESIS AND DISPLACEMENT OF THE VISUAL HORIZONTAL ASSOCIATED WITH HEAD (BODY) POSITION
Earl F. Miller, II and Ashton Graybiel Repr. from Aerospace Med. v. 34, no. 10, Oct. 1963 p 915–919 refs Presented at the 34th Ann. Meeting, Aerospace Med. Assoc., Los Angeles, 30 Apr. 1963
(NASA Grant NsG-R-47)

Subjects were tested in an upright and in a recumbent (left side) position. In both positions, the procedure was identical: empirical visual cues serving as a background to the luminous line target were alternately illuminated for two minutes, then darkened completely for five minutes during each period. It was found that a lack of visual cues did not appreciably influence the accurate and relatively stable localization of the horizontal, in the upright position; however, in the recumbent position, removal of these cues caused, after a brief lag period, a gradual spontaneous rotation of the phenomenal horizontal up to a maximum displacement typical for each subject. Superimposed upon these perceptual changes was the considerable fluctuant movement in horizontality which was described as a form of autokinesis (rotary). These illusions disappeared almost intantaneously when a visual framework was provided. Author

15 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gauges; sensors and transducers; and telescopes and cameras. *For related information see*: 06 Auxiliary Systems; 08 Communications; 09 Electronics; and 22 Navigation and Guidance.

N64-10799 Joint Publications Research Service, Washington, D.C.
DESCRIPTION OF MODEL 6 NEK-1 F 2 SIX-CHANNEL ELECTROCARDIOGRAPH
H. Fritzsch 23 Apr. 1963 15 p Transl. into ENGLISH from Feingeratetechnik (E. Berlin), no. 2, Feb. 1963 p 59–64
(JPRS-18859; OTS-63-21653) OTS: $0.50

A discussion is presented of the six-channel electrocardiograph (6 NEK-1 f 2) multiple recording instrument for reproducible simultaneous recording of up to 6 biophysical parameters of the human system, e.g., the electrocardiogram, the phonocardiogram, and the arterial and venous pulse rhythm. R.T.K.

N64-10949* Agriculture Dept., Beltsville, Md.
A SIMPLE PHOTOMETER WITH WIDE DYNAMIC RANGE
Karl H. Norris *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 209–215 refs (See N64-10937 02-01) GPO: $3.50

A multiplier-type phototube is operated in a constant-anode-current mode with the dynodes supplied with line voltage pulses through a high-voltage control tube. Circuits are given for both half-wave and full-wave operation. A dual-beam system is described for the full-wave circuit, using an optical-beam switch synchronized with the line voltage. A nonlinear attenuator corrects the photometer output to give a linear variation with optical density. Beam sorting is accomplished with transistor switches, and a cathode follower provides a low-impedance output. This photometer is shown to have a linear range of greater than 6 logarithmic decades, and a peak-to-peak noise equivalent to an optical-density change of 0.002 at a response time of 0.3 sec for full scale. Author

N64-10950* Grumman Aircraft Engineering Corp., Bethpage, N.Y.
EMISSOMETER, A DEVICE FOR MEASURING TOTAL HEMISPHERICAL EMITTANCE
R. Sadler, L. Hemmerdinger, and I. Rando *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 217–223 (See N64-10937 02-01) GPO: $3.50

An emissometer for measuring total hemispherical emittance at different temperatures is described. The apparatus consists of a specimen heater, thermally insulated from a larger heater or guard, so that heat is lost only by radiation from the specimen surface which faces the cold wall of a vacuum chamber. The emittance is thus calculated, when the resistance of the specimen heater, the current supplied to the heater, the temperature of the specimen surface, and the temperature of the cold wall are known, assuming no radiation is reflected to the specimen. The emissometer is especially useful for measuring the thermal-radiation properties of space materials because the determinations are carried out under a simulated space environment. E.W.

N64-10955* Yellott Solar Energy Lab., Phoenix, Ariz.
A SILICON CELL TRANSMISSIVITY-REFLECTIVITY METER FOR USE WITH SOLAR RADIATION
John I. Yellott and Lawrence Chamness *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 269–274 refs (See N64-10937 02-01) GPO: $3.50

This paper describes an adaptation of an inexpensive silicon cell pyrheliometer (Sol-A-Meter) which was originally intended to measure the intensity of the direct solar beam. It has been found that the instrument can also be used to make rapid determinations of the transmittance, τ, and reflectance, ρ, of transparent materials for solar radiation at incident angles from 0° to 80° The absorptance, α, which cannot be measured directly, can be found from the relationship: $\alpha = 1.00-(\tau+\rho)$. The limitations imposed by the spectral response of the typical silicon solar cell appear to have little adverse effect upon the accuracy of the results obtained with the Sol-A-Meter, while the strong signal and the instantaneous response of the instrument, combined with its low cost, make it a useful tool for determining solar-optical properties of transparent materials. Author

N64-10957* Lockheed Missiles and Space Co., Palo Alto, Calif.
A MULTICHAMBER CALORIMETER FOR HIGH-TEMPERATURE EMITTANCE STUDIES
A. I. Funai *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 317–327 refs (See N64-10937 02-01) GOP: $3.50

An eight-chambered vacuum calorimetric apparatus for measuring and evaluating the total hemispherical emittance of high-temperature radiator coatings is described. The method for obtaining emittance values is presented, and an error analysis identifies the important parameters. A detailed description of the sample, and the sample heating and temperature measuring systems, are also given. Preliminary results confirm the suitability of the apparatus for measuring emittances with an accuracy of ±5%. Author

N64-10958* Republic Aviation Corp., Farmingdale, N.Y.
INSTRUMENTATION FOR EMITTANCE MEASUREMENTS IN THE 400° TO 1800°F TEMPERATURE RANGE
A. Gravina, R. Bastian, and J. Dyer *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 329–336 For complete description, see WADD-TR-60-102, Final Rept. (See N64-10937 02-01) GPO: $3.50
(Contract AF 33(616)-5925)

Equipment is described which was used to measure simultaneously the spectral and total normal emittance of materials in the temperature range from 400° to 1800° F while contained in ambient and vacuum environment. Equipment design, setup, and experimental procedures are presented. Also included is a description of present activities directed toward the assembly of equipment which will help improve experimental accuracy, and also provide for angular emittance measurements in order to obtain more comprehensive data. Author

N64-10984 Aeronautical Research Labs., Melbourne (Australia)
RESISTANCE CHANGES IN GAUGES DURING STABILISATION AND ATTACHMENT
Katarine Muir and I. G. Scott Mar. 1963 14 p
(ARL/SM-279)

Changes in resistance values before and after stabilization for groups of two gage types were examined. No significant difference was found between the two gage types on a basis of available gage pairs. Author

N64-11042 Joint Publications Research Service, Washington, D.C.
UTILIZING MULTICHANNEL ELECTRONIC POTENTIOMETERS FOR PHYSIOLOGICAL INVESTIGATIONS
V. Ya. Berezovs'kiy and V. I. Mirutenko *In its* Articles on Med. and Physiol. 25 Mar. 1963 p 18–22 refs (See N64-11041 02-01) OTS: $0.75

Automatic, electronic self-registering potentiometers and similar devices were used for the simultaneous recording of variations in temperature, relative rate of blood flow, and infrared radiation, at four or six points. Schematic diagrams of the circuits employed by potiometers of this type are given. C.L.W.

N64-11130 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM ZHURNAL OBSHCHEY BIOLOGII (JOURNAL OF GENERAL BIOLOGY) [MOSCOW] VOL. 14, NO. 6, 1953

(JPRS-19786 OTS-63-22090) OTS: $0.75

The use of interference separation mirrors (interference light filters) in the fluorescent fluoroscopy of low transparency objects is described. The basic mirror consists of a cover glass coated on one side with a system of superimposed, very thin layers of transparent substances with alternating high and low refractive indices. This layer does not transmit the exciting fluorescent light and prevents it from exciting fluorescence of the cover glass, the immersion oil, and the objective and ocular lenses of the microscope. At the same time, it reflects the exciting light back to the preparation, stimulating its fluorescence and intensifying the brightness of its illumination. An opaque illuminator with an interference mirror for observing specimens *in vivo* is also described, using the "incident lighting" technique. D.E.R.

N64-11208 Hanford Atomic Products Operation, Richland, Wash.

PORTABLE RADIATION SURVEY INSTRUMENT

E. M. Sheen and W. G. Spear Sep. 1963 11 p

(Contract AT(45-1)-1350)

(HW-78872) OTS: $0.50

The rugged, compact instrument employs all solid-state circuitry, provides substantial aural output from a loudspeaker, has three metered counting-rate ranges, employs rechargeable batteries that can be charged without unsealing the instrument, has direct adaptability to continuous powerline operation, can operate 50 hr before charging is necessary, utilizes printed circuits which are interchangeable with other Hanford radiological instruments, operates correctly from −10° to +130° F, and has an expected unit cost for commercial production which is satisfactorily low. Distinct economic advantages were achieved with the ability to employ a variety of detectors, and with the possible continuous use as a line-powered general-purpose monitor for station applications. Author

N64-11277 Phillips Petroleum Co., Idaho Falls, Idaho Atomic Energy Div.

A METHOD OF DETERMINING VOLUMES AND SURFACE AREAS FOR GROUPS OF NON-UNIFORM SIZED PARTICLES

Earl S. Grimmett AEC Natl. Reactor Testing Station, 11 Oct. 1963 34 p refs

(Contract AT(10-1)-205)

(IDO-14617) OTS: $0.75

A method for calculating the surface area and volume of samples of particles of various sizes and shapes is outlined. This method depends upon a screen analysis of the sample, size and surface interval functions, and screen shape factors. The size and surface interval functions can be calculated; screen shape factors can be calculated for some regular geometrically shaped particles, can be estimated for other geometrically shaped particles, but must be determined experimentally for irregularly shaped particles. Author

N64-11278 Princeton U., N.J. Plasma Physics Lab.

INTEGRATING MULTIPOINT REMOTE AREA X-RAY SAFETY MONITOR

Herman L. Miller Jul. 1963 25 p refs

(Contract AT (30-1)-1238)

(MATT-193)

A multiple-point remote-area safety monitor for X-rays (or gamma radiation) above 50 Kev is described. It is designed for use with sources having duty cycles ranging from steady state (e.g., a radioactive source) to a pulse 100-microseconds long repeated every 40 seconds (e.g., a pulsed X-ray source). Radiation rates from background and dark current equivalent to 0.06 mr/hr to an instantaneous peak of 8,000,000 mr/hr are handled with a departure from linearity of at most 25% at the highest rate. The radiation is detected by a commercial plastic scintillator and photomultiplier. Output of the photomultiplier is integrated directly by an operational amplifier and polystyrene capacitor. Author

N64-11328* Geophysics Corp. of America, Bedford, Mass.

EXTENSION OF THE LOW PRESSURE LIMIT OF MCLEOD GAUGES Final Report

W. Kreisman Mar. 1963 74 p refs

(NASA Contract NAS1-2217)

(NASA CR-52877; GCA Tech. Rept.-63-8-N) OTS: $7.60 ph, $2.42 mf

A description is given of four methods of modifying an ordinary McLeod gage to extend its range of operation to lower pressures. The "multiple compression" technique used is that of accumulating gas samples and storing them in the closed end capillary of the gage. Experimental results are presented to show how pressures below 1 × 10^{-5} mm Hg are measured with greater precision and accuracy than can normally be obtained. Accumulated samples of nitrogen gas were stored in the closed capillary of the gage for periods of time up to 42 hours with no apparent loss or gain of molecules. Author

N64-11363* Michigan U., Ann Arbor

THE SENSITIVITY OF RADIOMETRIC MEASUREMENTS

E. J. Kelly (Lincoln Lab.), D. H. Lyons (Sperry Rand Corp.), and W. L. Root Repr. from J. Soc. Indust. Appl. Math., v. 11, no. 2, Jun. 1963 p 235–257 refs

(NASA Grant NsG-2-59)

An analysis of radiometer sensitivity, based essentially on quadratic estimators, is presented from an engineering standpoint. The measurement of noise power is discussed, the terms dc radiometer and modulated radiometer are defined, and a criterion of sensitivity is established. Next, a basically conventional analysis of dc radiometer sensitivity is given, and the effect of radiometer gain fluctuations is analyzed using a simple model. Finally, the sensitivity of a general type of radiometer is evaluated (including dc radiometers and conventional switched radiometers as special cases), and the performance of the general radiometer is optimized over the design parameters available. M.P.G.

N64-11376 Tokyo U. (Japan) Aeronautical Research Inst.

AN ELECTRICALLY-RECORDING ROTATIONAL RHEOMETER

Hirotaro Kambe and Masaharu Takano Aug. 1963 20 p refs

(*Its* Rept. 377 (Vol. 28, no. 9))

A coaxial cylindrical rheometer has been developed for measuring viscoelastic properties and flow properties of polymeric materials and of concentrated suspensions by oscillatory and/or stationary method. A feature of this apparatus is the completely automatic recording system which is achieved by means of the electric driving and detecting units. In place of a torsion wire, a torque motor is attached to the inner cylinder, and the deflection of the inner cylinder is measured by a special electromagnetic detector. A specially constructed alternating current generator is used for giving the oscillatory torque of very low frequencies below 1 c./sec. to the inner cylinder. The stiffness of the inner cylinder to deflection and the amplitude of torque acting on the inner cylinder can be varied continuously by use of the torque motor. Author

N64-11377 Tokyo U. (Japan) Aeronautical Research Inst.
CONE AND PLATE VISCOELASTOMETER FOR HIGH TEMPERATUES
Hirotaro Kambe and Masaharu Takano Sep. 1963 17 p refs
(*Its* Rept. 378 (Vol. 28, no. 10))

A versatile torsionally oscillating cone-and-plate rheometer was devised for measuring dynamic viscosity and dynamic modulus of molten polymer and disperse systems at temperatures of 30° to 250° C. This apparatus can be used for stationary flow measurements as a rotational cone-and-plate viscometer and for dynamic measurements under the same geometrical conditions. A feature of the rheometer is the completely automatic electrically detecting and recording system. The oscillatory torque is supplied to the shaft of the movable cone by a torque motor. The deflection of the cone is detected by a specially designed electric detector, and is recorded on an electric recorder. The distance between the truncated cone tip and the stationary plate is held at 1/100 mm by a micrometer unit with an electric contact. The ranges of measurements are 10^2 to 10^8 poises in viscosity and 10^2 to 10^8 dynes/cm^2 in modulus. Atmosphere in the chamber can be substituted by inert gas. The torsional constant of cone and the amplitude of torque acting on the cone can be varied continuously.
Author

N64-11407 Aeronautical Research Lab., Melbourne (Australia)
BIBLIOGRAPHY ON ELECTRICAL RESISTANCE STRAIN GAUGES Second Edition, Before and Including 1955
Katarina Muir, R. N. Robinson and I. G. Scott Apr. 1963 109 p refs
(Bibliog. ARL/SM4)

A collection has been made of known sources of information relating to electrical resistance strain gages, their characteristics, application, and use, together with the necessary electrical, or electronic, measuring equipment. Some closely related topics are also listed.
Author

N64-11423 Bendix Corp., Teterboro, N.J. Eclipse-Pioneer Div.
BAROMETRIC PRESSURE STANDARD AND CALIBRATION SURVEY Final Report
Leon Albin Aug. 1963 44 p
(Contract FA-WA-4170)

This project covers a survey which was conducted in the field at representative facilities employing barometric pressure devices which are used to calibrate or set aircraft altimeters. The facilities surveyed included eleven civil airport control towers with their associated weather stations, three military airport control towers, three military airport weather stations, two instrument repair shops (serving trunk airlines, feeder airlines, and supplemental airlines), eleven additional FAA certified instrument repair shops, four Air Force repair stations, two Navy repair stations, three Air Force calibration laboratories, two Navy calibration laboratories, and one FAA calibration laboratory. The report contains a description of the survey and a discussion of the overall results of the survey, together with recommendations for upgrading the accuracy of the barometric pressure measuring and calibration devices in the facilities and for continuing a program of this type.
Author

16 LIFE SCIENCES

Includes biology; exobiology; physiology; medicine; life support systems; radiation effects on biological systems; and space sickness. ***For related information see***: 14 Human Behavior; and 28 Space Radiation.

N64-10682 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM BOL'SHAYA MEDITSINSKAYA ENTSIKLOPEDIYA (GREAT MEDICAL ENCYCLOPEDIA) [MOSCOW], NO. 27, 1962
V. Parin et al 6 Feb. 1963 13 p refs Transl. into ENGLISH p 829–838
(JPRS-17497; OTS-63-21060) OTS: $1.00

Applications of radio engineering and electronics methods to scientific and practical medicine are discussed. The utilization of radioelectronics in medicine is proceeding basically along the following lines: (1) in scientific research for the development of medical science and public health practice, (2) in labor hygiene for the prevention of occupational diseases, (3) in the diagnosis of various diseases, (4) in the treatment of diseases and restitution of lost functions, and (5) in the mechanization of labor for servicing patients and for automation of the production of medical materials and drugs.
P.V.E.

N64-10683 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM SOVETSKAYA MEDITSINA [MOSCOW] VOL. 26, NO. 10, 1962
B. V. Petrovskiy et al 6 Feb. 1963 28 p refs Transl. into ENGLISH of four articles p 3–13; 42–45; 110–114
(JPRS-17498; OTS-63-21086) OTS: $0.75

CONTENTS:

1. ELECTRIC SLEEP AS A METHOD OF NEUROTROPIC TREATMENT OF ESSENTIAL HYPERTENSION G. V. Sergeyev p 15–19 (See N64-10684 02-16)

N64-10684 Joint Publications Research Service, Washington, D.C.
ELECTRIC SLEEP AS A METHOD OF NEUROTROPIC TREATMENT OF ESSENTIAL HYPERTENSION
G. Y. Sergeyev *In its* Transl. from Sov. Med., Moscow, v. 26, no. 10, 1962 6 Feb. 1963 p 15-19 (See N64-10683 02-16)

The effectiveness of electric sleep treatments given to 211 patients with essential hypertension and definite signs of neurosis and sleep disorders was characterized by restoration of the ability to work, normalization of sleep, and pronounced reduction in blood pressure.
P.V.E.

N64-10690 Joint Publications Research Service, Washington, D.C.
BIONICS, THE ENGINEERING ART OF NATURE
V. Bel'kevich, E. Vende, and I. Vil'-Vil'yams 6 Feb. 1963 17 p Transl. into ENGLISH of an article from Tekhn. Molodezhi (Moscow), no. 9, Sep. 1962 p 36–38
(JPRS-17500; OTS-63-21062) OTS: $0.50

The development and the applications of the principles of bionics, a branch of the science of engineering cybernetics, are discussed. The aim of bionics is the utilization of knowledge of biological processes and methods for solving engineering tasks.
R.T.K.

N64-10694 Joint Publications Research Service, Washington, D.C.
BIOCHEMICAL ASPECTS OF THE RADIATION METHOD OF FOOD PRESERVATION
L. V. Metlitskiy 7 Feb. 1963 39 p refs Transl. into ENGLISH of an article from Izvest. Akad. Nauk SSSR (Moscow), no. 6, 1962 p 869–884
(JPRS-17530; OTS-63-21078) OTS: $1.00

The complexity of using ionizing radiation to preserve food products is discussed. It is indicated that irradiation may serve to protect the product from one category of losses but contribute to another category at the same time. For example, irradiation may inhibit germination in potato tubers but weaken their resistance to microorganisms. Conditions favoring the preservation of color and vitamins in irradiated meat may not preserve the taste and odor of the meat, and may even have a negative effect on bacteria eradication. However, with irradiation it is possible to produce changes in food which cannot be produced in any other way, for example, the inhibition of activity in some enzymes with simultaneous stimulation of activity in others. This is not only of theoretical interest but may contribute to the development of new and improved methods for storing food products. I.v.L.

N64-10695 Joint Publications Research Service, Washington, D.C.

CENTRAL PROBLEMS IN ENGINEERING PSYCHOLOGY

V. P. Zinchenko and D. Yu. Panov 8 Feb. 1963 23 p refs Transl. into ENGLISH of an article from Voprosy Psikhologii (Moscow), no. 5, 1962 p 15–30
(JPRS-17544; OTS-63-21087) OTS: $0.75

A description of some of the specific features of the operator's activity in a control system is presented, and, on the basis of this description, a number of problems in engineering psychology are formulated. The activity of the operator with physical control models which replace the real controlled objects is taken as the subject of engineering psychology. The central problem of this science is to determine the requirements imposed on the models constructed, taking into account, to the maximum degree, the functional characteristics and capabilities of the operator. P.V.E.

N64-10713 Joint Publications Research Service, Washington, D.C.

A COMPLEX STUDY OF ELECTROPHYSIOLOGICAL, HISTOCHEMICAL, AND CYTOMORPHOLOGICAL INDICES OF BRAIN NEURON EXCITATION

A. B. Kogan 19 Feb. 1963 10 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSR (Moscow), v. 147, no. 4, 1962 p 985–988
(JPRS-17717; OTS-63-21167) OTS: $0.50

Efforts to analyze brain activity by synthesizing information obtained by physiological, biochemical, and structural-morphological techniques are reported. A device is described which, when chronically implanted in the brain of an animal, can simultaneously excite the brain cells, record the potential, and cold fix the neural structures. At the chosen moment in the final experiment, the metabolic and chemical transformations in the neurons are arrested by passing refrigerant through the device. Subsequent histochemical and electron microscopic studies of the cells can be compared with the electrophysiological characteristics of the tissues at the moment of fixation. Definite metabolic shifts, as indicated by succindehydrase activity, ribonucleic-acid distribution and other standand tests, were demonstrated in the excited neurons. M.P.G.

N64-10723 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM PATHOLOGICHESKAYA FIZIOLOGIYA I EKSPERIMENTAL NAYA TERAPIYA (PATHOLOGICAL PHYSIOLOGY AND EXPERIMENTAL THERAPY) [MOSCOW] VOL. 6, NO. 6, 1962

26 Feb. 1963 39 p refs Transl. into ENGLISH of four articles p 3–10; 44–56
(JPRS-17819; OTS-63-21206) OTS: $1.00

CONTENTS:

1. THE POSSIBILITY OF MODELING CERTAIN CONGENITAL DISEASES I. A. Piontkovskiy p 1–14 refs
2. TREATMENT OF ACUTE RADIATION SICKNESS BY THE METHOD OF TRANSPLANTING COLD-PRESERVED HOMOLOGOUS BONE MARROW V. A. Revis p 15–24 refs
3. EXPERIENCE OF USING S, BETA-AMINOETHYLISOTHIOURONIUM IN THE PROPHYLAXIS OF EXPERIMENTAL ACUTE RADIATION SICKNESS V. A. Razarenova p 25–31 refs
4. CHARACTERISTICS OF HETEROHEMOTRANSFUSION REACTIONS IN IRRADIATED RATS R. F. Yuris p 32–36 refs

N64-10742 Joint Publications Research Service, Washington, D.C.

DIGITAL COMPUTER RECOGNITION OF VISUAL IMAGES

M. A. Ayzerman 14 Mar. 1963 15 p Transl. into ENGLISH of an article from Nauka i Zhizn' (Moscow), no. 12, Dec. 1962
(JPRS-18126; OTS-63-21322) OTS: $0.50

The mechanism of learning to recognize visual images was studied in order to develop the simplest possible methods for the reproduction of this process on general-purpose digital computers. A hypothesis, the compactness hypothesis, was formulated, and algorithms were proposed for the solution of the learning process. Experiments were conducted on a general-purpose digital computer in order to verify the compactness hypothesis and the algorithms. R.T.K.

N64-10744 Joint Publications Research Service, Washington, D.C.

CLINICO-MORPHOLOGICAL CHARACTERISTICS OF CHRONIC RADIATION SICKNESS INDUCED EXPERIMENTALLY BY MEANS OF EXTERNAL IRRADIATION

N. N. Garvey, Ye. M. Politova, and G. N. Yelpat'yevskaya 15 Mar. 1963 13 p Transl. into ENGLISH from Gigiyena Truda i Profess. Zabolevaniya (Moscow), v. 7, no. 12, 1962 p 26–33 Presented at the Conf. of the Acad. Council of the Sci. Res. Inst. of the Min. of Health RSFSR, May 1960
(JPRS-18153; OTS-63-21332) OTS: $0.50

Rats were subjected to 0.5 to 1 r of gamma radiation daily for 6 months. Within 2 to 4 months, chronic radiation sickness developed, and upon further exposure, the second and even third stages of sickness developed. Upon cessation of exposure, those rats surviving after 5 to 8 months showed comparative restoration. The earliest external symptoms of sickness appeared in the nervous system, followed by instabilities in the peripheral blood system, marked plethora of the parenchymatous organs, and hematological changes including the inhibition of hemopoiesis, bone marrow degradation, and hematopoietic dystrophy. Dilation of pulmonary blood vessels and corresponding constriction of the alveoli were observed. The formation of clusters of plasma cells around the vessels of the skin, liver, brain, and gastrointestinal organs was also observed. D.E.R.

N64-10751 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM NAUCHNYYE DOKLADY VYSSHEY SHKOLY: FILOSOFSKIYE NAUKI (HIGHER SCHOOL SCHOLARLY PAPERS: PHILOSOPHICAL SCIENCES) [MOSCOW] NO. 5, 1962

B. M. Kedrov and M. A. Logvin 19 Mar. 1963 27 p refs Transl. into ENGLISH of two articles p 42–49
(JPRS-18208; OTS-63-21356) OTS: $0.75

CONTENTS:

1. THE INTERRELATIONSHIP BETWEEN TWO ASPECTS OF COGNITION B. M. Kedrov p 1–13

2. THE PHYSIOLOGICAL BASIS OF CONSCIOUSNESS IN THE LIGHT OF MOST RECENT RESEARCH ON BRAIN ACTIVITY M. A. Logvin p 14–24 refs

N64-10752 Joint Publications Research Service, Washington, D.C.

THE RESISTANCE OF INSECTS TO ULTRA-LOW TEMPERATURES

L. K. Lozina-Lozinskiy 19 Mar. 1963 7 p refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 147, no. 5, 1962 p 1247–1249
(JPRS-18218; OTS-63-21361) OTS: $0.50

The pupae of *Saturnia pyri*, eggs of the Asiatic locust, and corn borer caterpillars were subjected to various rates of freezing and low temperature ranges to −196° C. Slow chilling increases the survival rate of the insects, but certain zones must be traversed rapidly. The rate of warming is not essentially important. Low-temperature resistance is possible due to the ability of the tissues and cells with normal water content to survive freezing and the total cessation of metabolism. Vitrification was absent during the experiments. Tables of experimental results are included. J.E.T

N64-10756 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON HIGHER NERVOUS ACTIVITY

25 Mar. 1963 56 p refs Transl. into ENGLISH of four articles from Zhur. Vysshey Nervnoy Deystel'nosti im. I. P. Pavlov (Moscow), v. 12, no. 6, Nov.–Dec. 1962 p 985–1010; 1085–1096
(JPRS-18315; OTS-63-21399) OTS: $1.50

CONTENTS:

1. INTERACTION OF ANALYSORS DURING FLIGHT ON BOARD AIRCRAFT AND SPACE VEHICLES V. V. Baranovskiy, M.D. Yemel'yanov, and A. G. Kuznetsov p 35–45 refs (See N64-10757 02-16)

N64-10757 Joint Publications Research Service, Washington, D.C.

INTERACTION OF ANALYSORS DURING FLIGHT ON BOARD AIRCRAFT AND SPACE VEHICLES

V. V. Baranovskiy, M. D. Yemel'yanov, and A. G. Kuznetsov *In its* Transl. on Higher Nervous Activity 25 Mar. 1963 p 35–45 refs (See N64-10756 02-16)

Human activity during flight of spacecraft and aircraft involves the receipt and processing of large and varying amounts of information by the central nervous system. To analyze these processes, experiments have been conducted to elucidate the physiological laws of interaction of the optic, vestibular, and motor senses during flight conditions. EEG, pulse, blood pressure, respiration rate, motor reactions, and skeletal muscle biopotential were recorded during rotation while the subjects were in two positions—one firmly anchored, and the other with unstable support. The results indicate that all three sensory systems participate in the general sense of proprioception, and that when one system is suppressed, the subject loses at least part of his spatial orientation sense. D.E.R.

N64-10759 Joint Publications Research Service, Washington, D.C.

BIONICS

L. P. Krayzmer 26 Mar. 1963 114 p refs Transl. into ENGLISH of a book "Bionika", Moscow, State Power Publishing House, 1962 p 4–72
(JPRS-18372; OTS-63-21427) OTS: $2.50

The following topics are discussed: (1) neurons and nerve networks and their technical simulation, (2) mechanisms for coding and storing information, (3) self-organizing and cybernetic devices, and (4) analyzers and perceptors. R.T.K.

N64-10769 Joint Publications Research Service, Washington, D.C.

CYTOCHEMISTRY OF BLOOD GLYCOGEN IN MAMMALS AFTER SINGLE WHOLE-BODY X-IRRADIATION

A. L. Shabadash and Yu. B. Kheyfets (Acad. Sci. Armenian SSR) 1 Apr. 1963 21 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. i Embriol. (Moscow), v. 43, no. 12, Dec. 1962 p 29–35
(JPRS-18479; OTS-63-21470) OTS: $0.50

Experiments on white male albino rats subjected to a single irradiation of 800 r indicated that: (1) 10 to 13 minutes after irradiation there is a loss of glycogen by the neutrophils and thrombocytes; (2) the decrease in glycogen content is at a maximum 1 to 3 hours after exposure, during the phase of progressive leukocytosis and neutrophilosis; (3) disintegration of the polysaccharide progresses from the central, circumnuclear zones to the periphery of the cells; (4) 6 hours after irradiation, the peripheral blood is found to contain many destroyed neutrophils with only traces of glycogen; (5) after 24 hours there is a pronounced leukopenia, despite the development of new generations of cells with moderately high glycogen content approximating the normal; and (6) cytochemical impairment of glycogen metabolism caused by irradiation precedes morphologically-apparent injury to neutrophil nuclei and cytoplasm. P.V.E.

N64-10780 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON VIBRATION DISEASE AND THERMAL DEHYDRATION

5 Apr. 1963 24 p refs Transl. into ENGLISH of three articles from Gigiyena Truda i Profess. Zabolevaniia (Moscow), no. 1, Jan. 1963 p 4–13; 36–41
(JPRS-18576; OTS-63-21519) OTS: $0.75

CONTENTS:

1. MATERIALS ON THE PATHOGENESIS OF VIBRATION DISEASES Ye. Ts. Andreyeva-Galanina and N. I. Karpova 1–7 refs (See N64-10781 02-16)

2. APPLICATIONS OF VIBRATION STIMULATOR FOR DETECTING CERTAIN FUNCTIONAL SHIFTS IN WORKERS EXPERIENCING VIBRATIONS EFFECTS UNDER INDUSTRIAL CONDITIONS Z. M. Butkovskaya and Yu. S. Koryukayev p 8–14 refs (See N64-10782 02-16)

3. WATER AND SALT EXCHANGE IN THERMAL DEHYDRATION L. Gets p 15–21 refs (See N64-10783 02-16)

N64-10781 Joint Publications Research Service, Washington, D.C.

MATERIALS ON THE PATHOGENESIS OF VIBRATION DISEASE

Ye. Ts. Andreyeva-Galanina and N. I. Karpova *In its* Transl. on Vibrations Disease and Thermal Dehydration 5 Apr. 1963 p 1-7 refs (See N64-10780 02-16) OTS: $0.75

An experiment was designed to discover the morphological changes occurring in various sections of the nervous system under the action of local vibration. The experiments were carried out on rabbits, whose right hind paws were subjected to the action of vibrations at a frequency of 40 cps, and an amplitude of 1.35 mm. The greatest changes were noted in the plantar and tibial distal section of the nerves. Marked changes were also noted in the Schwann cells. In the nerve sheaths, a large number of macrophages, polyblasts, and fibroblasts, filled with disintegrating myelin and clumps of axons, were discovered. Morphological changes were observed in the intervertebral sensory ganglia; microscopic examination of the spinal column revealed reactive changes in the nerve cells of the anterior, lateral, and posterior horns of the cerebral gray matter. Morphological changes were also found in the white matter of the spinal column. R.T.K.

N64-10782 Joint Publications Research Service, Washington, D.C.

APPLICATION OF VIBRATION STIMULATOR FOR DETECTING CERTAIN FUNCTIONAL SHIFTS IN WORKERS EXPERIENCING VIBRATION EFFECTS UNDER INDUSTRIAL CONDITIONS

Z. M. Butkovskaya and Yu. S. Koryukayev *In its* Transl. on Vibration Disease and Thermal Dehydration 5 Apr. 1963 p 8-14 refs (See N64-10780 02-16) OTS: $0.75

A vibrational load (stimulus) was used as a functional test in polyclinical examination of concrete molders who are subjected in their work to the action of vibration. Changes that occur in the neuromuscular, central nervous, and cardiovascular systems as a result of the vibrational stimulus were studied. Among the subjects there were groups of patients with a clinical diagnosis of vibration disease, with functional disorders of the nervous system, with conditional diagnosis of vibration disease, and subjects who were healthy. Results indicated that the character of the responsive reaction to a vibration stimulus depends on the original condition of the organism. R.T.K.

N64-10783 Joint Publications Research Service, Washington, D.C.

WATER AND SALT EXCHANGE IN THERMAL DEHYDRATION

L. Gets *In its* Transl. on Vibration Disease and Thermal Dehydration 5 Apr. 1963 p 15-21 refs (See N64-10780 02-16) OTS: $0.75

Changes in the concentration of the chloride anion of sodium and potassium, and of the carbon dioxide anion in blood plasma during thermal dehydration were studied. An investigation was also made of the hematocrit value, the extracellular fluid, and the amount of circulating plasma. The results indicate: (1) at high air temperature and a body weight loss of 1% to 2%, perspiration is due mainly to water loss from both the extracellular extravascular spaces and the extracellular intravascular spaces (plasma), and to a small extent from the water of the erythrocytes; and (2) in spite of the decrease in the amount of circulating plasma, the salt concentration in the plasma does not change, although changes have been observed in the ion ratio between the erythrocytes and the plasma. R.T.K.

N64-10786 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM VOPROSY PSIKHOLOGII (PROBLEMS OF PSYCHOLOGY) [MOSCOW] NO. 5, SEPTEMBER-

16 Apr. 1963 65 p refs Transl. into ENGLISH of four articles p 15-30; 75-83; 107-112; 184-189
(JPRS-18719; OTS-63-21580) OTS: $1.75

CONTENTS:

1. CRUCIAL PROBLEMS IN ENGINEERING PSYCHOLOGY V. P. Zinchenko and D. Yu. Panov p 1-24 refs (See N64-10787 02-16)
2. A MATHEMATICAL ANALYSIS OF RECTILINEAR FORMS PERCEIVED VISUALLY V. S. Ivanov p 25-37 refs (See N64-10788 02-11)
3. ON THE SUBJECT OF SOCIAL PSYCHOLOGY B. D. Parygin p 38-50 refs
4. A CONFERENCE ON PSYCHOLOGICAL PROBLEMS OF CYBERNETICS N. I. Mayzel' and L. U. Fatkin p 51-62

N64-10787 Joint Publications Research Service, Washington, D.C.

CRUCIAL PROBLEMS IN ENGINEERING PSYCHOLOGY

V. P. Zinchenko and D. Yu. Panov *In its* Transl. from Voprosy Psikhologii (Prob. of Psychology) [Moscow] no. 5, Sep.-Oct. 1962 16 Apr. 1963 p 1-24 refs (See N64-10786 02-16) OTS: $1.75

An attempt was made to differentiate specific problems found in engineering psychology, which to a considerable degree make it different from the traditional psychology of labor. The solution of problems in engineering psychology demands (1) a wide range of research that will bring in specialists competent in the most diversified areas of knowledge, and (2) the concentration of efforts of many specialists in this field. Many of the problems mentioned are not new. Considerable experience in solving similar problems arising in connection with an analysis of human actions with real objects has accumulated in psychology of labor, in general psychology, physiology, hygiene, anthropology, and other human sciences. C.L.W.

N64-10797 Joint Publications Research Service, Washington, D.C.

RESPIRATION AND CONVERSION OF ENERGY IN THE LIVING CELL

Kotel'nikova *In its* Studies in Biophys. 23 Apr. 1963 p 21-33 (See N64-10795 02-01) OTS: $1.00

Topics discussed with respect to the primary transformations of energy in a living cell which occur during respiration are: (1) sources of energy for living beings, (2) respiration and anaerobic processes of glycolysis and fermentation, (3) energy accumulator—adenosintriphosphoric acid, (4) method of oxidation of nutrient substances in the cell, (5) respiratory chain and oxidation phosphorolysis, and (6) the role of mitochondria. P.V.E.

N64-10798 Joint Publications Research Service, Washington, D.C.

INSULIN AND ULTRASOUND

I. Ye. El'piner and L. I. Stekol'nikov *In its* Studies in Biophys. 23 Apr. 1963 p 34-37 (See N64-10795 02-01) OTS: $1.00

Results of studying the structure and hormonal activity of insulin treated with ultrasonic radiation in the presence of various gases (oxygen, argon, and hydrogen) are discussed. As a result of ultrasonic treatment of an insulin solution in the presence of oxygen, histidine instead of phenylalanine is discovered at the B- end of the insulin chain, which indicates the separation from the chain of fine peptides, apparently consisting of four aminoacid bases: phenylalanine, valine, asparagin, and glutamin. Results of experiments conducted on rabbits revealed a unique reaction on the part of the animals to insulin subjected to ultrasonic radiation in oxygen. The intramuscular introduction of the treated insulin in rabbits resulted in an increase rather than a decrease in the blood-sugar level. This increase in the blood-sugar content is caused by fine peptides which appear in an insulin solution treated by ultrasonic radiation in the presence of oxygen. P.V.E.

N64-10807 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM MEDITSINSKAYA RADIOLOGIYA (MEDICAL RADIOLOGY) [MOSCOW] NO. 1, JANUARY 1963

25 Mar. 1963 40 p refs Transl. into ENGLISH of five articles p 24-32; 36-46; 62-64
(JPRS-18904; OTS-63-21676) OTS: $1.25

CONTENTS.

1. PREOPERATIVE IRRADIATION OF MAMMARY CANCER VIA INTERSTITIAL ADMINISTRATION OF RADIOACTIVE COLLOIDAL GOLD A. V. Kantin, L. A. Kachur, V. I. Lapchenkov, and K. N. Chochia p 1-14 refs
2. DETERMINATION OF THE FUNCTIONAL STATE OF THE THYROID BY MEANS OF A DIAGNOSTIC SCINTILLATION APPARATUS OF THE DSU-61 TYPE V. N. Slavnov and T. P. Sivachenko p 15-19 refs
3. SOME RESULTS OF THE ELABORATION OF THE PROBLEM OF RADIOBIOLOGY IN PUBLIC HEALTH INSTITUTIONS IN 1961 Ye. I. Vorob'yev and L. V. Funshteyn p 20-29 refs
4. THE EFFECT OF PROLONGED INTERNAL IRRADIATION WITH RADIOACTIVE ZINC ON THE BIOELECTRIC ACTIVITY OF THE BRAIN OF RABBITS V. G. Ovakimov p 30-32
5. THE THERAPEUTIC EFFECT OF PURIFIED PROPERDIN IN ACUTE RADIATION SICKNESS OF MICE V. Ya. Vissarionova and I.L. Chertkov p 33-37 refs

N64-10814 Joint Publications Research Service, Washington, D.C.

A COMPARATIVE ANALYSIS OF PSYCHIC CONTROL AND REGULATION IN AUTOMATA

L. M. Bekker May 1963 17 p Transl. into ENGLISH from Voprosy Filosofii (Moscow), no. 2, 1963 p 70-81
(JPRS-19100; OTS-63-21782) OTS: $0.50

The discovery of a relationship between the structural system and the functional principle of information circulation in an objectival adaptive or transforming (by labor) effort of man, and the operations of automatic systems, reveals the real possibility of making a concrete analysis of these systems. The goal of such an analysis is to establish the specific character of the programing and regulating function of psychic processes as information signals in comparison with the regulating function of information signals controlling the dynamics of working operations in automatic systems. This report presents such an analysis. This analysis shows that the difference between all phenomenologically known characteristics of psychic control and the characteristics of regulation in automatic systems actually stems from differences in the methods under which those signals of information, which carry out the process of control, are organized. I.v.L.

N64-10850 Joint Publications Research Service, Washington, D.C.

SOME PROBLEMS IN THE ANALYSIS OF THE ELECTROGASTROGRAM AND ITS VARIANTS IN HEALTHY PERSONS DURING DIGESTION

I. G. Krasil'nikov and Yu. I. Fishzon-Ryss (Main Mil. Hosp., Moscow) 19 Nov. 1963 12 p refs Transl. into ENGLISH from Terap. Arkh. (Moscow), v. 35, no. 8, 1963 p 56-62
(JPRS-21925; OTS-63-41171) OTS: $0.50

Electrogastrograms of 59 healthy people aged from 19 to 25 were taken with the electrogastrograph EGS-3. It was shown that there are three variants of electrogastrogram in healthy people: normokynetic, hyperkynetic, and hypokynetic. The most frequent and typical for healthy people is the normokynetic variant, which was present in 66.1% of the cases. In this variant, most of the electrogastrogram waves had the amplitude varying between 0.2 to 0.4 and a frequency of approximately 3 per minute. The electrogastrogram may be influenced by the biocurrents of the hollow abdominal organs near the stomach, neuropsychological and emotional factors, and certain chronic toxic factors (smoking). All these factors should be taken into account for correct interpretation of the wave received. Author

N64-10854 Joint Publications Research Service, Washington, D.C.

MECHANISM OF THE INTERACTION OF FREE RADICALS FORMED FROM INHIBITORS OF RADICAL PROCESSES—WITH PROTEIN SH-GROUPS

A. I. Agatova, L. S. Vartanyan, and N. M. Emanuel' (Acad. Sci. USSR) *In its* Interaction of Free Radicals 21 Nov. 1963 p 1-6 refs Transl. into ENGLISH from Doklady Akad Nauk SSSR (Moscow), v. 150, no. 3, 1963 p 547-550 (See N64-10853 02-01) OTS: $0.50

The effect of free radical release from inhibitors on the enzyme, LDH (lactatedehydrogenase), was examined. A rabbit-muscle LDH preparation was used, and SH-groups were determined by amperometric titration in buffers. Using PG (propylgallate) as the inhibitor, it was found that accelerated consumption of SH-groups forming S-S bonds occurred in the presence of oxidizing PG. The addition of PG oxidation products to the protein molecules did not occur. R.T.K.

N64-10856 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON BIOCHEMISTRY

S. N. Aleksandrov et al 22 Nov. 1963 24 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR (Moscow), v. 150, no. 3, 1963 p 665-679
(JPRS-22022; OTS-63-41228) OTS: $0.75

CONTENTS:

1. COMPARATIVE EVALUATION OF THE PROTECTIVE EFFECTIVENESS OF MERCAMINE (BETA-MERCAPTOETHYLAMINE) DURING SINGLE AND FRACTIONATED IRRADATION S. N. Aleksandrov (Central Sci. Res. Inst. of Med. Radiol.) p 1-4 refs
2. MECHANISM OF RADIOBIOLOGICAL LABILIZATION OF HEMOGLOBIN Ye. A. Bauman p 5-8 refs
3. EFFECT OF SOMATOTROPIC HORMONE OF ANTERIOR HYPOPHYSIS ON BONE UNDER IRRADIATION CONDITIONS Ye. A. Ivanova (Acad. of Sci. USSR) p 9-13 refs
4. FREQUENCY OF DEVELOPMENT OF LUNG ADENOMAS IN MICE AS RELATED TO THE DOSE OF EXTERNAL GAMMA-IRRADIATION R. V. Smirnov (Central Sci. Res. Inst. of Med. Radiol.) p 14-16 refs
5. POST-BURNING CHANGES IN PROTEIN AND NUCLEIC ACID METABOLISM IN ANIMAL ORGANISMS T. L. Zayets and T. A. Borisova (Acad. of Med. Sci. USSR) p 17-21 refs

N64-10866 Joint Pubications Research Service, Washington, D.C.

TRANSLATIONS FROM BOL'SHAYA MEDITSINSKAYA ENTSIKLOPEDIYA (GREAT MEDICAL ENCYCLOPEDIA) [MOSCOW] VOLUME 27

N. P. Dubinin et al 28 Mar. 1963 86 p refs Transl. into ENGLISH of selected articles Columns 699–721; 770–824
(JPRS-18414; OTS-63-21446) OTS: $2.25

Translations are given of the following articles: (1) radiation genetics, (2) radiation hygiene, (3) radiation conditions, (4) radiation injuries in combat, (5) radiobiology, (6) radioisotopic diagnosis, (7) radioisotope laboratory, (8) radiological units, (9) medical radiology, (10) radar, (11) clinical radiometer, and (12) radiometric instruments. R.T.K.

N64-10867 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM FIZIOLOGICHNYY ZHURNAL (PHYSIOLOGY JOURNAL) [KIEV] NO. 1, JANUARY-FEBRUARY 1963

M. F. Sirotina and M. P. Adamenko 23 Apr. 1963 refs Transl. into ENGLISH of two articles p 77–88
(JPRS-18855; OTS-63-21652) OTS: $0.75

In the first article it was reported that short-term (10 to 15 m) submersion of aqualung divers in the sea lead to changes in the composition of the peripheral blood. In the majority of subjects, there was an increase in the number of leukocytes, red cells, reticulocytes, a slight increase in the number of thrombocytes, and accelerated sedimentation rate of the red cells. The observed changes in the number of formed elements of the blood were concluded to be manifestations of a redistribution reaction. Submersion of the aqualung divers to depths of 7 to 10 m was accompanied by neutral phylic reaction of the white cells; submersion to depths of 20 to 35 m showed a predominant lymphocytic reaction. The second article discussed the restoration of circulation and respiration in dogs after long periods of clinical death due to electric trauma. A new variant of the method of artificial circulation using a donor and a single autojector pump was utilized. The chief conclusion was that the time of the restoration of respiration cannot invariably be used to predict the success of revival. C.L.W.

N64-10934 North Carolina U., Chapel Hill School of Medicine

IRRADIATION AND THE NERVOUS SYSTEM

Charles D. Van Cleave N.Y., Rowman and Littlefield, Inc., 1963 433 p refs
(Sponsored by AEC) Available from Rowman and Littlefield, Inc., $9.75

Information on the effects of irradiation on the nervous system is presented in historical context, in order to relate current functional and behavioral concepts to older works which emphasized the clinical applications of irradiation. Topics discussed include: (1) effects of roentgen and radium radiation on the central nervous system (CNS) of experimental animals; (2) effects of therapeutic doses of X-rays and radium on the CNS of man; (3) effects of ionizing radiation on autonomic and peripheral nervous tissue in man and animals; (4) effects of ionizing radiation on the developing nervous system; (5) effects of massive high-intensity doses of ionizing radiation on the CNS of animals; (6) effects of whole-body exposures to ionizing radiation on the CNS of man; (7) effects of particle radiation on the CNS; (8) neurochemistry, electron microscopy, and the hematoencephalic barrier; (9) effects of radiation on sensory receptors; (10) functional changes in the nervous system resulting from irradiation; and (11) behavioral responses to ionizing radiation. M.P.G.

N64-10935 Atomic Energy Commission, Washington, D.C.

BIOLOGICAL EFFECTS OF EXTERNAL X AND GAMMA RADIATION, PART I

Raymond E. Zirkle, ed. (Chicago U.) New York, Mc Graw-Hill, 1954 554 p refs
(Natl. Nuclear Energy Ser., Manhattan Proj. Tech. Sect., Div. IV, v. 22B)

A collection of papers is presented reporting radiobiological work done under the Manhattan Project. The topics include: (1) the effects of long-continued total-body gamma radiation on mice, guinea pigs, and rabbits; (2) the effects of total-body X-irradiation on rabbits; (3) the effects of total-body X-irradiation on a preexisting induced anemia in rabbits; (4) heparinemia—an anticoagulant in the blood of dogs with hemorrhagic tendency after total-body exposure to X-rays; (5) electrophoretic study of the effects of X-rays on the plasma protein pattern in dogs; (6) effects of X-rays on the activity of enzymes; (7) effects of X-rays on tissue metabolism; (8) effects of X-rays on the metabolism of the small intestine and its permeability to glucose; (9) effects of X-rays on immunity; (10) radiation-induced changes in the UV absorption spectra of urine; (11) the effectiveness of drugs in preventing or alleviating X-ray damage; and (12) methods of exposure of animals to X-rays. M.P.G.

N64-10936 Rochester U., N.Y., School of Medicine and Dentistry

BIOLOGICAL EFFECTS OF EXTERNAL RADIATION (NATIONAL NUCLEAR ENERGY SERIES, MANHATTAN PROJECT TECHNICAL SECTION, DIVISION VI – VOLUME 2)

Henry A. Blair, ed. N.Y., Mc Graw-Hill Book Co., Inc., 1954 526 p refs
(Sponsored by AEC) Available from Mc Graw Hill Book Co., Inc., $7.00

The major part of the work on the biological effects of external radiation, performed during the war under the Manhattan Project and the Atomic Energy Commission, is included in this volume. The experiments were planned with the objectives of obtaining a description of the lethality and the pathological and genetic effects of both acute and chronic radiation, and of developing clinical criteria for detection of minimal effects of radiation in exposed personnel. The effects of single doses of whole-body X-radiation, chronic X-radiation, and fractionated doses of fast neutrons are discussed in separate parts, and each chapter is supplemented by references to parallel investigations. M.P.G.

N64-10989* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EFFECT OF DIURNAL FREEZE-THAWING ON SURVIVAL AND GROWTH OF SELECTED BACTERIA

R. S. Young, P. Deal, J. Bell and J. Allen Repr. from Nature, v. 199, no. 4898 14 Sep. 1963 p 1078–1079 refs Presented at the COSPAR Symp. on Extraterrestrial Life. Warsaw, 10 Jun. 1963

Survival and growth of microorganisms are investigated in terms of the effect of repeated diurnal freeze thawing. Experiments are reported which demonstrate the ability of some organisms to survive and grow well under freeze–thaw cycles typical of day–night conditions at the equator of the planet Mars in summer. C.LW

N64-11004 Joint Publications Research Service, Washington, D.C.

THE CONDITION AND THE PERSPECTIVES OF UTILIZATION OF COMMUNICATION, SIGNALING, AND TELEMETRY IN THE THERAPEUTIC PROCESS

R. A. Kapitanov 8 Feb. 1963 12 p refs Transl. into ENGLISH of an article from Sov. Zdravookhr. (Moscow), v. 21, no. 10, 1962 p 52–58
(JPRS-17534; OTS-63-20182) OTS: $0.50

A discussion is presented of the benefits of using various means of communication and telemetry in hospitals. Among these benefits are the improvement of the standard of medical service, the reduction of work waste, and the use of specialized telemetric systems for the control of conditions of seriously ill patients. R.T.K.

N64-11023 Joint Publications Research Service, Washington, D.C.
THE SIGNIFICANCE OF PLASMA CELLS IN ANTIBODY FORMATION PROCESS DURING IONIZING RADIATION
L. G. Kovtunovich and A. Yu. Rubnitskaya 8 Mar. 1963 13 p refs Transl. into ENGLISH of an article from Arkh. Patol. (Moscow), v. 24, no. 12, 1962 p 15–21
(JPRS-18020; OTS-63-21277) OTS: $0.50

The investigation consisted of a study of rats which were divided into 8 groups—four controls and four experimental. The investigations showed that the presence and degree of maturity of plasma cells in the lymph nodes, and especially in the spleen, of animals are a clear morphologic index of the process of antibody formation, which may be used to study the laws of immunogenesis, both under ordinary conditions and following ionizing radiation. C.L.W.

N64-11039 Joint Publications Research Service, Washington, D.C.
SELF-LEARNING AS ONE OF THE BASIC STEPS IN THE DESIGN OF SELF-ADJUSTING SYSTEMS
P. I. Chinaev *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 156–179 refs (See N64-11029 02-01)

Self-learning, in self-adjusting systems, is the best method for obtaining full information regarding the dynamic properties of an object, provided the speed of the self-adjusting system is not a limiting factor. A circuit which includes a self-learning model (with a digital or continuous-action computer) represents an additional, and more accurate, circuit for self-adjustment. It is advisable to introduce and index of the degree of self-learning to evaluate the degree of perfection of a process of self-adjustment. Self-adjusting systems, lacking elements of self-learning, should be regarded as self-adjusting systems with a zero level of self-adjustment. The higher the level of self-adjustment, i.e., the more circuits in the system containing elements of self-learning, the more perfect will be the process of self-adjustment. The functions of self-learning in a self-adjusting system can be different. They will depend on the task before the system and the purpose for which it is designed. I.v.L.

N64-11040 Joint Publications Research Service, Washington, D.C.
SOME QUESTIONS ON THE TEACHING OF AUTOMATA
A. A. Lyapunov *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 180–185 (See N64-11029 02-01)

A system of concepts for teaching automata is discussed. The direction in which such a system of concepts can be sought is the following. (1) Each automata with a memory is a learning automata. Learning is the dependence of the functioning of the automata upon the information inscribed in their memory unit. (2) The control system is of the hierarchic type, i.e., consisting of several control systems, wherein the systems at the lower command level receive the information directly from outside and process a direct response. During a unit of time in these cycles of control, numerous symbols, which have a small entropy, circulate. The next level of control receives information regarding the rate of work of each of its subordinate systems. (3) Each level of command can have a different range of activity. (4) The system can be readjusted in order to take experience into account. (5) Systems embodying the principle of reproduction, i.e., the creation of new units of control, are possible. I.v.L.

N64-11043 Joint Publications Research Service, Washington, D.C.
THE BASIC CONCEPT OF BIOMETRY AND ITS GENERAL APPLICATION
Ireneusz Juvancy (Hung. Acad. of Sci.) 27 Mar. 1963 29 p Transl. into ENGLISH of an article from Magyar Tudomany (Budapest), v. 7, no. 10, Oct. 1962

The concept of biometry is approached and its purpose and most important methods are described, along with its general application. The purpose of biometry is to widen the knowledge of biology and to make it more exact and more reliable. The objective of biometry therefore is identical with that of the biological sciences, but while its methods are applicable to any branch or to any problems of the biological sciences, biometry does not attempt to solve a biological problem. It serves as an aid to the biological sciences by helping to pinpoint problems. C.L.W.

N64-11044 Joint Publications Research Service, Washington, D.C.
THEORETICAL BASIS FOR THE PRINCIPLE OF SINGLE-CELLED ALGAE CULTIVATION
I. V. Smirnov 29 Mar. 1963 18 p refs Transl. into ENGLISH of an article from Biofizika (Moscow), v. 8, no. 1, 1963 p 90–100
(JPRS-18432; OTS-63-21454) OTS: $0.50

A study was conducted to provide the basis for a mathematical approach to the principle of cultivating chlorella, which will make possible a theoretical evaluation of the productivity of the culture under various methods of cultivation as a function of the basic factors of cultivation, both biological and design. An examination of the growth process of chlorella was carried out on the basis that the concentrations of the constituents of the mineral medium and the carbon dioxide in the suspension during the entire cultivation period remain sufficient to sustain normal culture growth. In the examination of the process it was assumed that the culture suspension remains constant and that the suspension density is uniform throughout the entire volume of the cultivator. It was also assumed that cell respiration does not depend on illumination and is proportional to the amount of biomass in the cultivator. The problem was therefore reduced to finding a correlation between the increase in the amount of biomass and the radiant energy absorbed with time. Here it is assumed that the radiant stream intensity lies in the linear portion of photosynthesis. C.L.W.

N64-11058 Joint Publications Research Service, Washington, D.C.
CYBERNETICS IN EDUCATION AND AUTOMATION
22 Apr. 1963 24 p refs Transl. into ENGLISH of two articles
(JPRS-18832; OTS-63-21637) OTS: $0.75

CONTENTS:

1. CYBERNETICS IN RELATION TO IMPROVED EDUCATION AND TRAINING Wilfried Lange p 1–15 refs (See N64-11059 02-16)

2. CYBERNETICS-AUTOMATION—THE NATURE OF THE WORK G. Klaus p 16–21 refs (See N64-11060 02-16)

N64-11059 Joint Publications Research Service, Washington, D.C.

CYBERNETICS IN RELATION TO IMPROVED EDUCATION AND TRAINING

Wilfried Lange *In its* Cybernetics in Educ. and Automation 22 Apr. 1963 p 1–15 refs Transl. into ENGLISH from Paedagogik (Berlin), no. 2, Feb. 1963 p 159–167 (See N64-11058 02-16) OTS: $0.75

This discussion includes: the problem of basic knowledge; correct technology of thought—basis of improvement in learning; and creative mental work—a primary prerequisite for mastering modern production. C.L.W.

N64-11060 Joint Publications Research Service, Washington, D. C.

CYBERNETICS – AUTOMATION – NATURE OF WORK

G. Klaus *In its* Cybernetics in Educ. and Automation 22 Apr. 1963 p 16–21 refs Transl. into ENGLISH from Feingeraetetechnik (Berlin), no. 3, Mar. 1963 p 97–98 (See N64-11058 02-16) OTS: $0.75

Cybernetics and automation are discussed in terms of production processes in industry, construction, transportation, research, planning and designing, accounting, and administration. It is stated that the use of cybernetics and automation in these and other areas will eliminate monotonous and stereotyped jobs. C.L.W.

N64-11063 Joint Publications Research Service, Washington, D.C.

THE USE OF ACTH AND ADRENAL CORTICAL HORMONES ON INDIVIDUALS WHO HAVE BEEN EXPOSED TO THE EFFECT OF IONIZING RADIATIONS

N. A. Kurshakov, N. N. Rynkova, and I. I. Sokolova 6 May 1963 10 p refs Transl. into ENGLISH of an article from Probl. Endokrinol. i Gormonoterap. (Moscow), no. 2, 1963 p 73–76

(JPRS-19066; OTS-63-21754) OTS: $0.50

The following symptoms served as indications for the use of corticoid hormones in individuals who had been subjected to the prolonged action of small doses of ionizing radiation: indirect and direct symptoms of adrenal cortex insufficiency, and a hypoplastic state of hemopoiesis with the presence of leucopenia. The use of pathogenetic therapy (ACTH, cortisone, prednisolone) in these individuals improved their general condition, raised the amount of leucocytes, neutrophiles, and thrombocytes, simultaneously reducing the number of eosinophiles, and lead less frequently to moderate lymphopenia and monocytopenia. R.T.K.

N64-11064 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM GIGIYENA I SANITARIYA (HYGIENE AND SANITATION) NO. 12, 1962

A. F. Aksyuk et al 6 May 1963 20 p refs Transl. into ENGLISH of 4 articles (Moscow)

(JPRS-19067; OTS-63-21755)

These discussions on hygiene and sanitation concern: the effect of small concentrations of fluorine on the organism; the effect of fluorine in drinking water on the functioning of the central nervous system; sanitary indices for water reservoirs covered with a monomolecular film; and air ionization of large premises by means of wire aerials connected to a Franklinization unit. C.L.W.

N64-11066 Joint Publications Research Service, Washington, D.C.

TEXTBOOK OF SURGERY

B. Ye Pankrat'yev, ed., and B. M. Khromov 20 May 1963 40 p Transl. into ENGLISH of a selected chapter and table of contents from a book "Rukovodstvo po Khirurgii" Moscow, 1962 p 5–9 and 710–726

(JPRS-19278; OTS-63-21860) OTS: $1.00

A discussion is presented of the effect of ionizing radiation on wounds. Two main types of surgical problems occur: (1) when the effect of ionizing radiation on a wound surface depends on the direct radiation effect of radioactive agents entering the wound (radioactive mixtures); and (2) when the course of the wound process is complicated by the presence of one form or another of radiation sickness (combined radiation injuries). Recommended therapy is presented. A distinction is made between external and internal sources of radiation, although the resulting pathogenic effect is largely the same in both cases. A description is given of the biological mechanism of the primary effect of ionizing radiation. R.T.K.

N64-11067 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM NEKOTORYE PROBLEMY DEYSTVIYA IONIZIRUYUSHCHEY RADIATSII NA NERVNUYU SISTEMU (CERTAIN PROBLEMS OF THE EFFECT OF IONIZING RADIATION ON THE NERVOUS SYSTEM)

M. N. Livanov 20 May 1963 46 p refs Transl. into ENGLISH of Chapter II, conclusion, and table of contents, Moscow, 1962 p 24–47, 174–177, and 195–196

(JPRS-19284; OTS-63-21865) OTS: $1.25

Basis mechanisms are discussed of the effect of ionizing radiation on the nervous system. Included in the discussion are: reflected effect of radiation upon the central nervous system; and changes in the neural centers as the results of radiation effect on the periphery. The reactions of the nervous system to radiation that were discussed started with the initial ones—the functional—and ended with the subsequent ones which develop as an aftereffect of irradiation. C.L.W.

N64-11068 Joint Publications Research Service, Washington, D.C.

THE ULTRAVIOLET FLUORESCENCE OF MUSCLES

I. Ya. Barskiy, V. A. Brumberg, and Ye. M. Brumberg 20 May 1963 6 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR (Moscow), v. 147, no. 2, 1963 p 474–476

(JPRS-19287; OTS-63-21868) OTS: $0.50

The intensity of ultraviolet fluorescence of various tissues was compared with their content of tryptophan. Results indicate that in the tested tissues there is no direct relationship between the content of tryptophan and the intensity of ultraviolet fluorescence. Ultraviolet fluorescence of muscles is therefore determined, not by the presence of tryptophan-containing proteins, but by some other fluorescent substance, or by tryptophan present in the muscles in some other state than it is in epithelial and connective tissues. R.T.K.

N64-11069 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM PERVICHNYYE PROTSESSY LUCHEVOGO PORAZHENIYA (PRIMARY PROCESSES OF RADIATION INJURY)

B. N. Tarusov 23 May 1963 30 p refs Transl. into ENGLISH of excerpts from booklet Moscow, Gostomizdat 1963 p 2, 85–93, 94–96

(JPRS-19363; OTS-63-21900) OTS: $0.75

Factors which determine the radiosensitivity of organisms to the effects of ionizing radiation are discussed. Included was the role of protection performed by vegetable pigments in plant cells and that performed by the natural antioxidants in animal organisms. C.L.W.

N64-11097 California U., Berkeley. Lawrence Radiation Lab.

BIOELECTRIC SENSITIVITY TO IRRADIATION OF THE RETINA AND VISUAL PATHWAYS

C. T. Gaffey and A. K. Kelley 9 Sep. 1963 41 p refs
(Contract W-7405-eng-48)
(UCLR-11005) OTS: $1.00

A study has been made of the acute effects of ionizing radiation on the visual pathways of the cat, as revealed by electrophysiological techniques. Irradiation sources were: 910 Mev alpha particles from the 184-inch cyclotron, 40-Mev alpha particles from the heavy ion linear accelerator, and 250 kv X-rays. Rotational procedures restricted irradiation to the eye, optic tract, or optic chiasma. The b-wave amplitude of the electroretinogram served as an index of the functional sensitivity of retinal cells to unilateral irradiation. Photically evolved responses from chronically implanted bipolar electrodes in the optic tract provided a quantitative means of evaluating the influence of unilateral optic-tract irradiation. Midline irradiation of the optic chiasma was performed, and blockage of interocular transfer was used as a measure of the effectiveness of irradiation. Ophthalmoscopic examinations were performed on irradiated cats. Author

N64-11103* Aeronutronic, Newport Beach, Calif.

STUDY OF BASIC BIO-ELECTROCHEMISTRY Quarterly Engineering Progress Report, 20 Jun.-19 Sep. 1963

M. H. Boyer, R. C. Bean, Y. H. Inami, and W. C. Shepherd 19 Oct. 1963 69 p refs
(NASA Contract NASw-655)
(NASA CR-52607; U-2332) OTS: $6.60 ph, $2.27 mf

The survey of enzyme systems pertinent to the field of bioelectrochemistry has continued with the testing of two sugar oxidases from different sources, a diaphorase system, arginase, and an amino acid decarboxylase, L-glutamic acid decarboxylase. None of these was found effective for current production at normal electrode potentials without use of carriers. The bioelectrochemical activity of the D-amino acid oxidase tryptophan system has been extensively characterized. A combination of electrochemical, spectrophotometric and chronopotentiometric techniques has demonstrated that the major source of current in this system is the electrode oxidation of indole pyruvic acid, one of the major products of the enzyme-substrate reaction. A highly significant finding, from chronopotentiometric studies, has been that high electrode oxidation potentials may result in poisoning of the electrode with adsorbed oxidation products of the electroactive species. Author

N64-11121 Joint Publications Research Service, Washington, D.C.

THE INFLUENCE OF COSMIC FACTORS ON THE BLOOD SYSTEM

N. A. Shul'ts 30 Apr. 1963 15 p refs Transl. into ENGLISH of an article from Probl. Gematol. i Perelio. Krovi (Moscow), v. 8, no. 3, 1963 p 20–26
(JPRS-18960; OTS-63-21709) OTS: $0.50

A review of the most important literature on the effect of cosmic radiation on the human organism is given. The results are presented of experiments designed to demonstrate the effect of cosmic radiation on the blood system. R.T.K.

N64-11123 Joint Publications Research Service, Washington, D.C.

A HANDBOOK FOR VECTORCARDIOSCOPY

I. T. Akulinichev 2 May 1963 186 p refs Transl. into ENGLISH of a book "Prakticheskiye voprosy vektorkardioskopii", Moscow, State Med. Publ. House, 1960 214 p refs
(JPRS-19030; OTS-63-21740) OTS: $3.00

The topics discussed are: the vector and the vectorgram, the electrical vectors of the heart, vectorcardiography, the physical basis of vectorcardiography, the model of the electrical field, the law of signs and the polarity of the vectorcardiogram, the system of leads for biovoltages in vectorcardiography, the projection of a vectorcardiogram, the precardial system of vectorcardiography, the criterion of reliability and the questions of vectorcardiography standardization, analyzing and reading vectorcardiograms, a normal vectorcardiogram, the electrocardiogram and the vectorcardiogram, the vectorcardiogram with diffuse changes of the myocardium, the vectorcardiogram with hypertrophies of the ventricular myocardium, the vectorcardiogram with coronary insufficiency and myocardial infarct, the vectorcardiogram and the electrocardiogram with focal changes of the myocardium, the diagnostic significance of vectorcardiography, technical questions of vectorcardioscopy, Soviet vector-electrocardioscopes, and the use of the vectorcardioscope. R.T.K.

N64-11124 Joint Publications Research Service, Washington, D.C.

MEDICINE AND PHYSICS

B. V. Ognev and G. D. Novinskiy 6 May 1963 127 p refs Transl. into ENGLISH of a booklet "Meditsina i Fizika", Moscow, Znaniya Publishing House of the All-Union Soc. for Dissemination of Political and Sci. Inform., 1962 p 1–64
(JPRS-19043; OTS-63-21743) OTS: $2.75

The problems which arose in medical science in connection with the development of physical, technical and other related sciences are discussed as follows: cybernetics and bionics, information theory, radiometry, electron optics, polymeric materials, illuminating devices, television, luminescence, ultrasound, mirror effect, and atomic energy. The relation between cybernetics and medicine is discussed as follows: the historical development of cybernetics, the control of the organism, lifeless models of living processes, and diagnosis by machine. R.T.K.

N64-11127 Joint Publications Research Service, Washington, D.C.

LOWERING THE IMMUNOBIOLOGICAL RESISTANCE OF THE ORGANISM AS A MANIFESTATION OF THE IRREVERSIBLE COMPONENT OF RADIATION SICKNESS

I. G. Akoyev et al 13 May 1963 12 p refs Transl. into ENGLISH of an article from Med. Rad. (Moscow), v. 8, no. 2, 1963 p 47–50
(JPRS-19152; OTS-63-21805) OTS: $0.50

The influence of preliminary irradiation conditions on the life span of mice after contamination with toxin was studied. Results indicate that in an irradiated organism, for a period of time after restoration of radioresistance and reparation of reversible radiation injuries, lesions remain in the mechanism of immunobiological resistance for a long time. This mechanism determines the ability of the organism to counteract the influence of bacterial toxins. Manifestation of these lesions, which was displayed in the reduction of the average life span after contamination by a toxin, increased when the irradiation dose was increased. However, the conditions of radiation (single or double) and the increase in time intervals between irradiations did not influence the degree of reduction of the organism's immunity. R.T.K.

N64-11132 Joint Publications Research Service, Washington, D.C.

NEW TASKS IN DEVELOPMENT OF BIOCHEMICAL PRODUCTIONS

5 Jul. 1963 8 p Transl. into ENGLISH of an article from Med. Prom. SSSR (Moscow), no. 4, 1963 p 3–6
(JPRS-20041; OTS-63-31215) OTS: $0.50

The creation of new therapeutic substances for the prevention and treatment of disease is discussed. Particular emphasis is placed on the microbiological transformation method whereby it is possible to obtain a rearrangement of the molecules of chemical compounds, approximating their structure to the structure of biologically important elements of the cell. R.T.K.

N64-11134 Joint Publications Research Service, Washington, D.C.

LIFE IN OUTER SPACE

N. Sisakyan 15 Jul. 1963 15 p Transl. into ENGLISH of an article from Pravda (Moscow), 21 Jun. 1963 p 2 and 6
(JPRS-20168; OTS-63-31283) OTS: $0.50

The following biological problems encountered in spaceflight are discussed: (1) those related to flight dynamics—overloading, vibration, noise, and weightlessness; (2) those characterizing space as an extraordinary habitat—ultraviolet, infrared, ionizing radiation, barometric pressure, unusual thermal regime, etc.; (3) those relating to prolonged living in the hermetically sealed cabin of a spacecraft—isolation, limited space, unusual food, diurnal rhythms, microclimate, etc. In addition, the results of efforts to find life in outer space are discussed. R.T.K.

N64-11136 Joint Publications Research Service, Washington, D.C.

STUDIES ON THE EFFECT OF IONIZING RADIATIONS UPON THE NERVOUS SYSTEM

P. F. Minayev 23 Jul. 1963 41 p refs Transl. into ENGLISH of portions of a book "Vliyaniye Ioniziruyushchikh Izlucheniy n na Tsentral'nuyu Nervnuyu Sistemu", Moscow, Publishing House of the Acad. Sci. USSR, 1962 p 5–7; 84–113; 131
(JPRS-20317; OTS-63-31367) OTS: $1.25

The following articles are included: (1) effect of ionizing radiations on the nervous system, (2) significance of the initial state of the nervous system under the effect of ionizing radiations, and (3) the nature of changes caused by the irradiation of neural tissue. R.T.K.

N64-11206 Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.

PROCEDURES AND EQUIPMENT USED IN INHALATION STUDIES ON SMALL ANIMALS

R. G. Thomas and R. Lie Sep. 1963 37 p refs
(Contract AT(29-2)-1013)
(LF-11) OTS: $0.75

Procedures and equipment used in exposing small animals to aerosols of fission products are described. The exposure chamber with attached plethysmographs for monitoring the respiratory patterns is shown diagrammatically, and the operational plan is set forth. Construction criteria for the plethysmographs are also included in detail. The descriptions concerning the animals include specifications on metabolism units and cleaning procedures, whole-body counting, and somewhat detailed sacrifice and necrotomy procedures. Author

N64-11211 Joint Publications Research Service, Washington, D.C.

THE INTERRELATION OF ALGAE AND MICROORGANISMS

M. M. Telitchenko, N. V. Davydova, and V. D. Fedorov 13 Mar. 1963 12 p refs Transl. into ENGLISH of an article from Nauchn. Dok. Vyşshei Shkoly, Biol. Nauki (Moscow), no. 4, 1962 p 157–163
(JPRS-18092; OTS-63-21309) OTS: $0.50

The results of studying the effect of growing cultures of protococcal algae (*Chlorella vulgaris* and *Scenedesmus obliquus*) on the survival rate of the causative agent of mouse typhus *Salmonella thyphimurium* are presented. It is concluded that algologically and bacteriologically pure cultures of protococcal algae (*Chlorella vulgaris* and *Scenedesmus obliquus*), during the multiplication process, release into the medium compounds showing antibacterial properties in regard to the bacteria of the group *Salmonella thyphimurium* (strains number 175, 710, 204, 2110, 3048, and 7091). The antibacterial properties of the compounds produced by the *S. obliquus* alga, in relation to the *S. thyphimurium* strains studied, are apparently stronger than for the compounds produced by the alga *Ch. vulgaris*. P.V.E.

N64-11216 Joint Publications Research Service, Washington, D.C.

THE CELL DRYING MECHANISM IN PROLIFERATING CULTURES OF THE BLUE-GREEN ALGAE ANABAENA VARIABILIS AND AMORPHONOSTOC PUNCTIFORME

V. D. Federov 20 May 1963 10 p ref Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 144, no. 6, 1962 p 1380–1383
(JPRS-19286; OTS-63-21867)

Investigations were made of the content of living cells with the aid of triphenyltetrazolchloride (TTC) in pure cultures of the blue-green algae *Anabaena variabilis* and *Amorphonostoc punctiforme* growing in mineral media. These investigations have shown that at the time of the lag phase of growth, the harvest of algae decreases slightly; the percentage content of live cells in the cultures, on the other hand, increases. Changes in the percentage of dying cells during algal growth are also presented. Upon transferring blue-green algae into a new medium during the lag phase, there is autolysis of dead cells introduced with the inoculate, which leads to an increase in the proportion of live cells in the cultures. R.T.K.

N64-11217 Joint Publications Research Service, Washington, D.C.

THE EFFECT OF SODIUM GALLATE ON THE NUCLEIC ACID CONTENT IN THE ORGANS OF HEALTHY AND IRRADIATED RATS

V. A. Barboy et al 23 May 1963 10 p refs Transl. into ENGLISH of an article from Ukr. Biokhim Zh. (Kiev), v. 35, no. 1, 1963 p 84–90
(JPRS-19355; OTS-63-21895) OTS: $0.50

An investigation was made of the effect of the intra-abdominal introduction of sodium gallate in a 60-mg dose per kg of weight on the NA (nucleic acid) content of the liver, spleen, the mucous membrane of the small intestines, and testicles of rats which were either unirradiated or were irradiated with a 750-r dose. Results are presented. R.T.K.

N64-11219 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM OCHERKI PO ISTORII AVIATSIONNOY MEDITSINY (OUTLINES ON THE HISTORY OF AVIATION MEDICINE) [MOSCOW, 1962]

A. A. Sergeyev 9 May 1963 56 p refs Transl. into ENGLISH of portions of a book, 1962 p 206–232; 289–300
(JPRS-19125; OTS-63-21794) OTS: $1.50

A discussion is presented of aviation medicine in the U.S.S.R. during World War II. A summary is given of the research conducted by various military medical institutes during that period. R.T.K.

N64-11220 Joint Publications Research Service, Washington, D.C.

LUMINESCENT SERUMS

P. K. Tabokov et al 28 Jun. 1963 9 p refs Transl. into ENGLISH of an article from Zh. Mikrobiol., Epidemiol. i Immunobiol. (Moscow), v. 33, no. 10, 1962
(JPRS-19936; OTS-63-31159) OTS: $0.50

A new method for the isolation of immune euglobulins (antibodies) from agglutinating antiplague and anticholera serums is proposed, and a new method of purifying the labeled antibodies from the fluorochrome excess is presented. The method of isolating and purifying antibodies shortens the time required to prepare luminescent conjugates from 3 to 4 weeks to 3 to 4 days. The method of preparing fluorochrome-labeled antibodies is realizable in any laboratory, since it requires no special equipment, such as refrigeration, centrifuges, and rooms. The immune euglobulins isolated by the new method are classifiable among the gamma-globulines in their electrophoretic composition. Advantages of the new luminescent stain (fluorescein isothiocyanate) over fluorescein isocyanate are presented. P.V.E.

N64-11223 Joint Publications Research Service, Washington, D.C.

CONSCIOUSNESS AND THE BRAIN

M. A. Logvin 19 Jul. 1963 57 p refs Transl. into ENGLISH of a book "Problema soznaniya i mozg", Moscow, Znaniye Publ. House, All-Union Soc. for the Propagation of Political and Sci. Knowledge, 1963 48 p
(JPRS-20270; OTS-63-31339) OTS: $1.50

Discussions are presented of the following topics: (1) I. P. Pavlov's doctrine and recent research on brain activity, (2) the physiological basis of consciousness, and (3) the nature of consciousness. R.T.K.

N64-11224 Joint Publications Research Service, Washington, D.C.

BIOCHEMICAL CHANGES RESULTING FROM IRRADIATION, HIGH TEMPERATURE, BURNS, AND POLIOMYELITIS

22 Jul. 1963 32 p refs Transl. into ENGLISH of five articles from Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 7, no. 2 Mar.–Apr. 1963 p 9–14; 58–62; 68–71
(JPRS-20298; OTS-63-31356) OTS: $1.00

Included in this report are: (1) some immunological data on the fate of bone marrow transplanted to dogs after whole-body irradiation, (2) changes in mineral and protein metabolism in calcified tissues following thermal burns, (3) the mechanism of changes in vascular-tissue permeability following the effect of high external temperature on the organism, (4) the change of heteroprotein specificity under the effect of temperature and pressure, and (5) the activity of cholinesterase of various protein tissues of mice during experimental poliomyelitis. R.T.K.

N64-11225 Joint Publications Research Service, Washington, D.C.

ARREST AND RESTORATION OF CARDIAC ACTIVITY

V. Marinesku et al 22 Nov. 1963 8 p Transl. into ENGLISH of an article from Khirurgiya (Moscow), no. 9, Sep. 1963 p 19-22
(JPRS 22010; OTS-63-41220) OTS: $0.50

A number of problems relative to the diagnosis and treatment of cardiac arrest are discussed on the basis of 83 cases. Reversible cardiac arrest (without severe incompatible-with-life lesions) is emphasized. The authors undertook resuscitation in 75 cases with complete success in 33 patients; successful results were achieved in 45 cases. The treatment consisted in massage of the heart and artificial respiration, as well as blood transfusion when necessary. Ventricular fibrillation supervened in 20 patients; this complication was treated by means of an electric defibrillator with successful results in 8 patients. The maximal duration of successful resuscitation amounted to 63 minutes. Author

N64-11226 Joint Publications Research Service, Washington, D.C.

LONG-RANGE CONSEQUENCES OF ACUTE CARDIAC ARREST

V. I. Maslov 22 Nov. 1963 11 p Transl. into ENGLISH of an article from Khirurgiya (Moscow), no. 9, Sep. 1963 p 14-18
(JPRS-22012; OTS-63-41221) OTS: $0.50

Out of 105 patients who had sustained acute heart arrest, 41 were successfully resuscitated and discharged from the hospital in satisfactory condition. Most resumed their usual avocations or studies. In 10 patients there were specific sequelae of cardiac arrest in the form of psychosthenia, inhibition, euphoria, deterioration of the memory, etc. With timely and effective heart massage, and in the absence of prolonged hypoxia preceding acute cardiac arrest, no neuropsychic disorders were noted in the remote sequelae. The article contains a description of two observations. In instances of impending development of posthypoxiac brain lesions, the utilization of prolonged therapeutic hypothermia in the immediate restorative period following resuscitation is advocated. Author

N64-11258* Maryland U., College Park, Md.

DETECTING AND RECORDING THE BEHAVIOR OF ANIMALS IN A MULTI-ENCLOSURE, PROGRAMMED ENVIRONMENT

Jack D. Findley Repr. from Bio-Telemetry, 1963 p 213–216
(NASA Grant NsG-189-61)

Outlined are two examples of experiments on the behavior of more than one organism in a physical environment composed of interconnected enclosures and on the programing of the conditions by which the animals move from chamber to chamber and of the behavioral requirements within each chamber. One example was a multienclosure for use with dogs, the other for use with chimps. Simple telemetry proved to be an essential part of each operation. C.L.W.

N64-11259* Florida State U., Tallahassee

IMPROVED METHOD FOR THE PSYCHOPHYSICAL STUDY OF THE TEMPERATURE SENSE

D. R. Kenshalo Repr. from Rev. Sci. Instr., v. 34, no. 8, Aug. 1963 p 883–886 refs
(NASA Grant NsG-148-61; Publ. Health Serv. Grant B-2992)

Peltier refrigerators are almost ideal transducers to provide the precise temperature control necessary for investigation of thermal sensitivity. The operation of Peltier refrigerators is briefly described, and a circuit is presented which automatically controls the temperature of the refrigerator to within ±0.025° C of a predetermined value. Changes in the temperature of the refrigerator from 0.05° to 10° C can be obtained with less than a 2% error. Author

N64-11269 Joint Publications Research Service, Washington, D.C.

PSYCHOPHARMACOLOGICAL COMPOUNDS

Yu. A. Aleksandrovskiy et al 26 Nov. 1963 53 p Transl. into ENGLISH of a booklet "Psikhofarmakologicheskiye preparaty" Moscow, Min. of Health RSFSR, 1962 26 p
(JPRS-22042; OTS-63-41237)

A brief description is presented of the classification method for psychopharmacological compounds. Synonyms of psychopharmacological drugs are listed in alphabetical order. The official names of compounds are given in order, and are followed by references to subordination to any given group of compounds presented in the table of psychopharmacological drugs which is included. This table contains basic information on the chemical structure of the compound, indications and counterindications of its application, recommended dosages, and notes on its effects. P.V.E.

N64-11270 Joint Publications Research Service, Washington, D.C.

THE ALGORITHMICAL APPROACH TO THE ANALYSIS OF TEACHING METHODS IS VALID

L. N. Landa 29 Nov. 1963 34 p refs Transl. into ENGLISH of an article from Voprosy Psikhologii (Moscow), no. 4, 1963 p 143–152
(JPRS-22075; OTS-63-41254) OTS: $1.00

A rebuttal is presented of a paper entitled "Is the 'Algorithmical' Approach to the Analysis of Teaching Methods Valid," which criticizes an earlier paper by the present author. P.V.E.

N64-11272 Joint Publications Research Service, Washington, D.C.

PATHOGENIC EFFECT OF LOW AND MEDIUM DOSES OF GAMMA-RAYS ON THE PROGENY OF IRRADIATED INSECTS

V. Ya. Podolyan 3 Dec. 1963 10 p refs Transl. into ENGLISH of an article from Tr. Inst. Zool. i Parazitol., Akad. Nauk Tadzh. SSR, Parazity Dikikh Zhivotn. Kazakhstana (Alma-Ata), v. 19, 1963 p 220–225
(JPRS-22107; OTS-63-41271) OTS: $0.50

The effect of low and medium doses of gamma-irradiation (source, GUT-400 cobalt gun) on adult winged specimen of the spring carrion fly (*Protophormia terrae novae*) and on the progeny of these insects from the first to the fifth generation was investigated. Results indicate that: (1) A pathogenic effect is exerted by comparatively low doses of irradiation in arthropods and particularly in Diptera. (2) The particular hazard of low and medium doses of gamma-rays lies in the fact that, aside from a direct pathogenic effect on the specimens being irradiated, the rays exert a destructive effect on subsequent generations of irradiated specimens, which is expressed in the occurrence of a high percentage of unfertilized eggs, high mortality rate of the larvae and pupae, and an extremely low egg productivity of the female. All of these factors lead to degeneration and extinction of progeny of irradiated insects. These results indicate that the release of irradiated males and females en masse, under natural conditions, could offer a means for the control of parasitic arthropods which are vectors of infectious diseases and infestations in man and other animals. I.v.L.

N64-11273 Joint Publications Research Service, Washington, D.C.

THE EFFECT OF PROTON AND GAMMA-RADIATION ON THE FUNCTIONAL STATE OF THE VESTIBULAR ANALYZER

A. A. Sveshnikov 4 Dec. 1963 9 p refs Transl. into ENGLISH of an article from Med. Rad. (Moscow), v. 8, no. 9, 1963 p 48–52
(JPRS-22120; OTS-63-41278) OTS: $0.50

After irradiation with high energy protons in doses of 500 and 350 rads, pronounced changes in the vestibular mechanisms of dogs were observed only when there was a considerable disorder of the general compensatory mechanisms (during the climax of radiation sickness). A single dose of radiation of 200 r produces a more pronounced change in the function of the vestibular mechanism than the same dose of 200 r given fractionally (every other day in a dose of 9 r). Essential changes in the autonomic vestibular reactions were observed only after ionizing radiation in high doses. R.T.K.

N64-11274 Joint Publications Research Service, Washington, D.C.

DEPRESSION OF ANTIBODY PRODUCTION IN MONKEYS AFTER GAMMA-IRRADIATION IN HIGH DOSES

S. M. Pekerman 4 Dec. 1963 8 p refs Transl. into ENGLISH of an article from Med. Rd. (Moscow), v. 8, no. 9, 1963 p 61-65
(JPRS-22121; OTS-63-42179) OTS: $0.50

The purpose of the present investigation was the determination of conditions of irradiation ensuring a complete inhibition of the immunological reactivity in monkeys in connection with bone marrow transplantation. Fifteen monkeys (*Macaca rhesus*), aged 2 to 3 years, were subjected to gamma irradiation in doses of 314, 407, 592, 714, and 814 r. Twenty-four hours later all these monkeys and 9 control monkeys were immunized with typhoid vaccine, sheep erythocytes, egg yolk, or horse serum. Doses of 315 and 407 r did not inhibit the immunological reactivity, while doses of 592 and 714 r caused a considerable inhibition of the latter, manifested by a reduction of the titers of antibodies and their delayed formation. In irradiation with a dose of 814 r, there was seen a complete inhibition of antibody formation. Although doses of 592 and 714 r are lethal for monkeys, they do not cause a complete inhibition of the immunological reactivity, which takes place only with a dose of 814 r. Author

N64-11293* IIT Research Inst., Chicago, Ill.

LIFE IN EXTRATERRESTRIAL ENVIRONMENTS Quarterly Status Report, 15 Sep -15 Nov. 1963

Charles A. Hagen and Regnal Jones [1963] 20 p
(NASA Contract NASr-22; IITRI Proj. C194)
(NASA CR-52841; IITRI-C194-11) OTS: $1.60 ph, $0.80 mf

Bacterial counts are given for soil samples collected at Rocky Mountain National Park, Colorado and White Sand National Monument, New Mexico. Faculative, lecithinase positive microorganisms were isolated from a variety of desert and tundra soil samples. These bacteria were able to survive the simulated Martian environment of the experiment. Fungal components of lichen species were isolated and were able to survive the Martian atmosphere. Apothecia germination, with mycelial growth also occurred in the simulated Martian environment. Some pigmentation of lichenized fungi grown in the Martian atmosphere was noticed. R.T.K.

N64-11316 Joint Publications Research Service, Washington, D.C.

CHANGES IN THE MECHANICAL PROPERTIES OF SYNTHETIC VASCULAR PROSTHESES

N. B. Dobrova and A. D. Drogaytsev 10 Apr. 1963 15 p refs Transl. into ENGLISH of an article from Khirurgiya (Moscow), no 2, 1963 p 137–141
(JPRS-18644; OTS-63-21557) OTS: $0.50

The changes in the mechanical properties of a plastic tubule, used as a substitute for a blood vessel when it is placed in the organism, are reviewed in an effort to increase the efficiency of such transplants. To determine the strength and elasticity of such materials as polyamides, polyesters, and polytetrafluoroethylene, implants into the cardiovascular system of dogs have been studied for periods of two weeks, as well as *in vitro* experiments on the variations in volume of such substances as nylon and caprone, terilen, dacron and lavsen, teflon, and fluorolon, with a change in internal pressure. The same substances were tested after implantation to find that the polytetrafluoroethylene substances, teflon and fluorolon, were the most chemically inert in the animal and that the alteration of mechanical properties on implantation depend to a great degree on the chemical inertness. D.E.R.

N64-11317 Joint Publications Research Service, Washington, D.C.

AVERAGE DIAMETER OF ERYTHROCYTES DURING CHRONIC ACTION OF SMALL DOSES OF IONIZING RADIATION ON THE HUMAN ORGANISM

Ye. D. Gol'dberg 26 Apr. 1963 6 p refs Transl. into ENGLISH of an article from Lab. Delo (Moscow), no. 2, 1963 p 9–11
(JPRS-18938; OTS-63-21696) OTS: $0.50

Significant changes in the acid stability of the erythrocytes of people normally subjected to small doses of ionizing radiation in their daily work have been demonstrated. These changes are manifested by a shortened life span of the erythrocytes and their average diameter, which tends to macrocytosis. This points out the general tendency toward stable changes in erythropoiesis in the direction of an increase in the specific gravity of the macroblastic hemopoiesis. D.E.R.

N64-11318 Joint Publications Research Service, Washington, D.C.

THE BLOOD COAGULATION SYSTEM

M. S. Machabeli 16 May 1963 17 p Transl. into ENGLISH of chapter four and the table of contents of a book "Sistema Svertyvania Krovi", Tiflis, Acad. of Sci. Georgian SSR, 1961 p 186–189, 273–275
(JPRS-19219; OTS-63-21830) OTS: $0.50

A hypothesis for the physiological process of hemostasis is constructed, presenting only the basic links of the humoral process generally, rather than specifically. The coagulation process is divided into three phases, thromboplastin formation, thrombin formation, and fibrin formation. Retraction and fibrinolysis are called "post-phase," since, at this time, coagulation is completed, the fibrin clot is formed, and all subsequent phases lead to a subsiding of the process. Clot retraction is then discussed as a process depending on the quality and quantity of thrombocytes, fibrinogen, thrombin concentration, plasma correlation, anticoagulants, calcium concentration, the ionic strength of the medium, and temperature. The action of physiological anticoagulants is discussed. The enzymatic process of fibrinolysis is described as dependent on the profactors, kinase, and inhibitors. D.E.R.

N64-11319 Joint Publications Research Service, Washington, D.C.

THE EFFECT OF ASCORBIC ACID ON THE FUNCTION OF THE SUPRARENAL GLANDS UNDER THE INFLUENCE OF HIGH AMBIENT TEMPERATURE

E. L. Perel'man and F. F. Sultanov 3 Jul. 1963 7 p refs Transl. into ENGLISH of an article from Zdravookhr. Turkmenistana (Ashkhabad), v. 7, no. 4, Apr. 1963 p 3–6
(JPRS-20011; OTS-63-31198) OTS: $0.50

The effect of ascorbic acid on the function of the suprarenal glands of rats, under the influence of high ambient temperature, was investigated. Results indicate that: acute overheating ("heat shock") is associated with a pronounced reduction in the ascorbic-acid content of the suprarenal glands without increase in the weight of these glands; a simultaneous increase in the ascorbic-acid concentration of the blood is observed. It may be supposed that these changes are the results of exhaustion of the suprarenal function under the influence of excessive heat, which leads to a disorder of adaptive mechanisms. Under these conditions of excessive heat, the suprarenal glands make inadequate use of ascorbic acid, possibly because of reduction in the synthesis of steroid hormones (which may be indicated by the lack of increase of their weight), and a large quantity of ascorbic acid is discharged into the blood. I.v.L.

N64-11320 Joint Publications Research Service, Washington, D.C.

CHANGES IN THE ANTERIOR LOBE OF THE HYPOPHYSIS DURING IRRADIATION AND COOLING

Ye. B. Pavlova 5 Jul. 1963 9 p refs Transl. into ENGLISH of an article from Probl. Endokrinol. i Gormonoterap. (Moscow), v. 9, no. 3, 1963 p 3–7
(JPRS-20037; OTS-63-31211) OTS: $0.50

Twenty-four hours after irradiation (at the period of maximal corticosterone secretion by the adrenal glands) experimental animals showed marked adrenal hypertrophy, with the appearance of vacuolized delta-basophils in the anterior lobe of the hypophysis. As the result of a 3-day cooling period, there was hypertrophy of the adrenal glands, thymus involution, and vacuolization of the delta-basophilic cells in the hypophysis. Similar changes in the delta-basophilic cells of the anterior lobe of the hypophysis are regarded as a morphological manifestation of intensified ACTH secretion in response to unfavorable effects. Author

N64-11346 Joint Publications Research Service, Washington, D.C.

STUDIES IN BIOLOGICAL SCIENCES, USSR

Yu. B. Kudryashov, B. A. Lomsadze, Liu Hao-t'u, and Ye. V. Stefanovich 17 Apr. 1963 22 p refs Transl. into ENGLISH of 2 articles from Nauchn. Dokl. Vysshei Shkoly, Biol. Nauki (Moscow), no. 1, 1963
(JPRS-18760; OTS-63-21600) OTS: $0.75

The topics included are: (1) the disturbance mechanism of protein autolysis in the liver of irradiated rats, and (2) the change in the biocurrents of muscles under the influence of stimulants of the first and second signal systems during human muscular activity. R.T.K.

N64-11349 Joint Publications Research Service, Washington, D.C.

PREVENTION AND TREATMENT OF ACUTE RADIATION SICKNESS IN DOGS WITH THE AID OF SODIUM GALLATE, USSR

O. O. Horodets'kyy and V. A. Baraboy 20 May 1963 8 p refs Transl. into ENGLISH of an article from Fiziol. Zhur., Akad. Nauk Ukr. RSR (Kiev), v. 9, no. 2, 1963 p 240–244
(JPRS-19269; OTS-63-21852) OTS: $0.50

The use of sodium gallate in the prevention and treatment of acute radiation sickness in dogs was investigated. Results indicate that: (1) The intravenous administration of sodium gallate in dogs, 30 minutes prior to irradiation with a dose of 600 r, led to the survival of three out of five animals and caused a prolongation, by seven to ten days, of the average length of life of the animals which died. (2) The administration of sodium gallate immediately after irradiation of dogs with the 600-r dose also led to survival of three dogs out of seven, and to an increased length of life of the animals, which later died in an average of six days. (3) The antiradiation influence of sodium gallate, when given before as well as after irradiation, leads to a mitigation of the severity of the clinical course of radiation sickness and to a postponement by four to eight days, or more, of the period of fulminating radiation sickness. (4) Sodium gallate should be introduced into clinical use as an antiradiation measure. I.v.L.

N64-11352 Joint Publications Research Service, Washington, D.C.

PROBLEMS OF PERCEPTION AND THE PHENOMENON OF "ATTUNEMENT" OF THE SENSE ORGANS

P. G. Snyakin and A. I. Yesakov 20 Jun. 1963 14 p refs Transl. into ENGLISH of an article from Voprosy Filosofii (Moscow), no. 2, 1963 p 61–69
(JPRS-19762; OTS-63-22080) OTS: $0.50

The phenomenon of man's attainment of knowledge through the sense organs is discussed. Many facts concerning the modern physiology of analyzers have been accumulated, revealing the material substrate of sensation and the structures responsible for its initial emergence. The so-called phenomenon of "adjustment" of the sensory apparatus, which is regarded by some as being the physiologic mechanism which underlies the development of this correspondence between perception and the objects of the natural world, is discussed in particular. P.V.E.

N64-11353 Joint Publications Research Service, Washington, D.C.

THE PROBLEM OF THE IRRITATING EFFECT OF IONIZING RADIATION

K. Sh. Nadareyshvili 24 Jun. 1963 14 p refs Trans. into ENGLISH of an article from Soobshcheniya Akad. Nauk Gruzin. SSR (Tiflis), v. 30, no. 2, 1963 p 213–220
(JPRS-19806; OTS-63-31095) OTS: $0.50

It is established that the early changes of various physiological functions, originating after the start of irradiation, represent a complex neuroreflex act. To demonstrate the existence of ensuing sensory or subsensory phenomena, rabbits were exposed to X-rays and then placed under intense illumination. It is concluded that: (1) X-ray irradiation of various regions of the body manifests characteristics of an irritating agent in reference to certain physiologic functions, (2) with combinations of X-ray irradiation and electrocutaneous irritation, defensive conditioned reflexes can be developed, and (3) following a total X-ray dose of the head or whole-body irradiation, the electrodefensive reflexes are reduced and may disappear. D.E.R.

N64-11354 Joint Publications Research Service, Washington, D.C.

THERAPEUTIC AND CYTOTOXIC EFFECT OF ANTIBODIES AND THEIR ROLE IN THE PATHOGENESIS OF RADIATION SICKNESS

I. N. Mayskiy et al 5 Jul. 1963 28 p refs Transl. into ENGLISH of an article from Usp. Sovrem. Biol. (Moscow), v. 55, no. 2, 1963 p 219–238
(JPRS-20040; OTS-63-31214) OTS: $0.75

Experiments dealing with the action of various kinds of sera on malignant growths are discussed. The sera include anti-organ and anti-cancer in relation to irradiated tumor cells and anti-enzymatic sera obtained through immunization with ronidase. The experiments are as follows: (1) a study of the action of cytotoxic antibodies in the metastasizing of the Brown–Pierce tumor in rabbits; anti-organ sera obtained from sheep liver, kidneys, and lungs were used; (2) a study of the stage-wise character of anti-cancer serum action; (3) a study of immunogenesis and allergic reactions in rabbits with transplanted Brown–Pierce tumor upon their vaccination with tularemia vaccine; (4) a study of the effect of sera produced from goats and horses through immunization with ronidase on cancerous rabbits; this study was aimed at inactivating the growth propagation factor. I.v.L.

N64-11355 Joint Publications Research Service, Washington, D.C.

STUDIES IN IONIZING AND X-RAY IRRADIATION

O. P. Domareva, N. I. Nuzhdin, I. A. Nechayev 30 Jul. 1963 59 p refs Transl. into ENGLISH of 2 chapters and table of contents from the book "Deystviye Ioniziruyushchikh Izlucheniy na Organizm" Moscow, Publ. House of Acad. Sci. USSR, 1962 p 162–166, 173–197, and 207
(JPRS-20421; OTS-63-31418) OTS: $1.50

Two investigations are discussed in this report. One investigation deals with the role of the adrenal glands in the mechanism of transmission of the distant effect of radiation. As a test object, the mitotic activity of the cornea of X-irradiated mice was selected. Results indicate that screening of the adrenal glands does not change the distant radiation effect, whereas their removal eliminates this effect. The second investigation deals with the effect of protective substances on the survival and the changes in the internal organs of mice with different radiosensitivity, when subjected to X-ray irradiation. Results indicate that differences in the natural radiosensitivity of the CC_{57}-brown, C_3H, and BALB/c mice are connected with differences in the specific radioresistance of their spleen and liver. This is attested to not only by the dynamics of the weight indices of these organs, but also by the analysis of the data on diethylstilbestrol protection. These data show that the natural differences in radiosensitivity against a total X-ray irradiation with a 600-r dose are leveled off when protected with a preliminary administration of diethylstilbestrol. I.v.L.

N64-11356 Joint Publications Research Service, Washington, D.C.

NEW METHOD OF APPLYING ELECTRODES OF AN IMPLANTED ELECTRIC STIMULATOR

V. S. Savel'yev 19 Nov. 1963 6 p refs Transl. into ENGLISH of an article from Grudnaya Khirurgiya (Moscow), no. 5, Sep/Oct. 1963 p 98–100
(JPRS-21909; OTS-63-41159) OTS: $0.50

A new method is presented for applying the electrodes of an implanted electric stimulator, which makes it possible to exclude the effect of respiratory movements of the interspaces on the electrodes during respiration. The method is as follows: The implanted electric stimulator is put under the skin in the area of the left subcostal margin. Below the xiphoid process the aponeurosis is divided in the midline for two centimeters. By dull dissection a tunnel is formed in the anterior mediastinum for subsequent passage of the myocardial electrodes into the left pleural cavity. A thoracotomy is performed on the patient in the fourth interspace, from the sternum to the midaxillary line. The pericardium is incised two to three centimeters to the front of, and in parallel with, the phrenic nerve. The mediastinal pleura is cut at the sternum at the place where it goes onto the diaphragm. The electrodes are brought out through the tunnel in the anterior mediastinum, and sutured to the myocardium along the axis of the heart. P.V.E.

N64-11357 Joint Publications Research Service, Washington, D.C.

OSMOTIC STABILITY OF LEUKOCYTES IN PERSONS SUBJECTED TO THE ACTION OF SOME OCCUPATIONAL HAZARDS, USSR

A. V. Scheglova 4 Dec. 1963 7 p refs Transl. into ENGLISH of an article from Probl. Gematol. i Pereliv. Krovi (Moscow), v. 8, no. 10, 1963 p 26–29
(JPRS-22122; OTS-63-41280) OTS: $0.50

The osmotic stability of leukocytes (O.S.L.) in persons working in various occupations was investigated. Occupational factors considered were those of roentgenologists coming in contact with benzene and with lead, the combined influence of radiation and lead, the combined influence of X-ray and magnetic fields, and patients with chronic lead and benzene intoxication. Results showed that: (1) in the radiographologists, the percentage content of these cells was increased from 1.5 to 2 times by comparison with the control; (2) in subjects with benzene intoxication, the altered cells were considerably more abundant than in subjects who were in contact with benzene; (3) in work with lead, and when lead intoxication was actually apparent, the number of altered cells remained the same as in the control group; (4) in subjects working under the combined influence of lead and gamma-radiation, the percentage content of altered and destroyed cells was sharply increased by comparison with their number under the action of each one of these factors separately; and (5) under the combined action of X-ray and a field of high frequency, the number of altered cells was somewhat greater than under the action of X-rays alone. P.V.E.

N64-11358 Joint Publications Research Service, Washington, D.C.

THE MECHANISM OF ACTION OF PROTECTIVE-THERAPEUTIC COMBINATIONS IN ACUTE RADIATION SICKNESS IN RATS, USSR

T. N. Protasova 4 Dec. 1963 7 p refs Transl. into ENGLISH of an article from Med. Radiol. (Moscow), v. 8, no. 9, 1963 p 66–68
(JPRS-22123; OTS-63-41281) OTS: $0.50

The effect of protective–therapeutic combinations on the oxidative degradation of the amino acids, dl-alanine, glutamic acid, and tyrosine, in the liver of gamma-irradiated rats was investigated. The protective combination consisted of amygdalin, aureomycin, nicotinic acid, and $NaHCO_3$, and was administered orally for three days before irradiation. The therapeutic combination consisted of streptomycin in a novacain solution, securinine, ascorbic acid, vitamin P, vitamin B_1, and vitamin B_6. Results indicate that: (1) the successive use of protective and therapeutic combinations exerted a definite normalizing effect on the activity of the enzyme systems (amino acids); this applies particularly to the tyrosine oxidation system, the activity of which in the treated animals was close to normal for almost the entire period after irradiation; (2) the combination of protection and therapy proved to be less effective than protection and therapy separately; (3) the activity of various enzymes reacts differently to the administration of protective and therapeutic agents. I.v.L.

N64-11359 Joint Publications Research Service, Washington, D.C.

EFFECT OF CERTAIN PROTECTIVE SUBSTANCES ON CHANGES IN THE REACTIVITY OF TISSUE SULFHYDRIL GROUPS IN IRRADIATED ANIMALS, USSR

L. I. Korchak and T. A. Speranskaya 4 Dec. 1963 6 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSSR (Moscow), v. 151, no. 3, 1963 p 712–713
(JPRS-22125; OTS-63-41283) OTS: $0.50

The effect of protective substances on the changes in the reactivity of thiol groups in the liver-tissue-homogenate of X-irradiated mice was investigated. The protective substances were morphine, unithiol, β-aminoethylisothiuronium bromide hydrobromide, cystamin, and cysteinamin. The reactivity of the thiol groups was judged on the basis of the change in content of these groups in the process of the incubation of the homogenate for 2 hours at 37° C. Determination of the thiol groups was made by the method of amperometric mercurimetric titration. Results indicate that protective substances, whether or not their protective action depends on the creation of tissue hypoxia (as in the case of morphine) or whether their counterradiation is connected with the diminution of the pressure of oxygen in the tissues (as in the case of cystamin, cysteinamin, and β-aminoethylisothiuronium bromide hydrobromide), prevent to approximately the same extent the radiation change of the reactivity of the thiol groups in radiosensitive tissue. Unithiol did not weaken the influence of ionizing radiation on the reactivity of tissue thiol groups. I.v.L.

N64-11375* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FORMATION OF ADENOSINE BY ULTRA-VIOLET IRRADIATION OF A SOLUTION OF ADENINE AND RIBOSE

Cyril Ponnamperuma, Ruth Mariner and Carl Sagan (Harvard U.) Repr. from Nature, v. 198, no. 4886, 22 June 1963 p 1199–1200 refs

The formation of adenosine by the ultraviolet irradiation of a solution of adenine-8-^{14}C and ribose was investigated. The amount of adenosine formed was estimated from a count of the aliquot of the elute from the chromatogram by liquid scintillation counting, using an internal standard of toluene labelled with C^{14}. Results were as follows: (1) The yield of adenosine was about 0.01% with phosphoric acid and with polyphosphate ester. The corresponding quantum yield for the production of adenosine is then about $\sim 10^{-5}$. (2) The adenosine synthesis appeared to be independent of pH. (3) No adenosine was detected when adenosine and ribose were irradiated with ultraviolet light in the absence of phosphorus. This result may possibly confer a unique role to phosphorus in the evolution of compounds of biological significance. From these results, it can be concluded that the formation of adenosine by the relatively simple abiological method described in this report is significant in the context of the gradual evolution of life on this planet over a period of several hundred million years. I.v.L.

N64-11383* Radiation Applications, Inc., Long Island City, N.Y.

WATER RECOVERY STUDY Quarterly Report for Apr.–Jun. 1963

9 Aug. 1963 16 p refs
(NASA Contract NASw-520)
(NASA CR-51575; RAI 323) OTS: $1.60 ph, $0.80 mf

Ultrafiltration studies have centered on the fabrication of membrane filters capable of direct rejection of the urea species present in urine. Membrane filters prepared from specially cast cellulose acetate and cellophane were evaluated. Further experimentation in the optimization of the cellulose acetate membrane filter employed in the ultrafiltration of modified urine was undertaken. The results to date indicate that either prior urea removal, or conversion to an ionic derivative such as an ammonium salt, shows the maximum promise for the ultrafiltration mode of potable water recovery. Author

N64-11414 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM AKUSTICHESKIY ZHURNAL (ACOUSTIC JOURNAL) VOL. 8, NO. 4, OCTOBER-DECEMBER 1962

Ye. A. Radionova 11 Apr. 1963 14 p refs Transl. into ENGLISH of an article p 447-453
(JPRS-18659; OTS-63-21564) OTS: $0.50

A study has been made of the reliability of measuring the intensity of a short sound signal at the level of the primary neuron of the auditory system by recording the summational nervous response to a click from the round window of the cochlea. In analyzing the relationship of the amplitude of summational nervous response to the intensity and dispersion of the click, it is concluded that, in the peripheral division of the auditory analyzer, two groups of nervous elements exist (a more sensitive and a less sensitive), which make it possible to measure the intensity of a short sound signal over a wide range, but which, however, produce a slight lowering of differential sensitivity in the range of moderate intensities. Author

N64-11415 Joint Publications Research Service, Washington, D.C.

FUNDAMENTALS OF PRACTICAL BALLISTO-CARDIOGRAPHY

R. M. Bayevskiy 30 Apr. 1963 153 p refs Transl. into ENGLISH of a book "Osnovy Prakticheskoy Ballisto-Kardiografii" Moscow, Medgiz, 1962 p 3-173
(JPRS-18967; OTS-63-21713) OTS: $3.00

The following topics are discussed: (1) a brief historical outline on the development of ballisto-cardiography, (2) physical fundamentals of ballisto-cardiography, (3) techniques and methods of ballisto-cardiography, (4) normal ballisto-cardiogram (BKG) and its variations, (5) analysis and clinical BKG evaluation, (6) BKG changes during various illnesses, (7) application of ballisto-cardiography in surgery, obstetrics, physiotherapy, health resorts and physical therapy, and sports and aviation medicine, and (8) mass ballisto-cardiography. R.T.K.

N64-11416 Joint Publications Research Service, Washington, D.C.

DEVELOPMENT OF TECHNICAL CYBERNETICS

9 Dec. 1963 10 p Transl. into ENGLISH of an article from Vestnik Akad. Nauk SSSR (Moscow), no. 9, 1963 p 3-8
(JPRS-22188; OTS-63-41318) OTS: $0.50

The study of control processes is discussed with regard to the construction and optimal control of fully automatic machines. The electric and electronic advances that permit the solution of problems of technical cybernetics are mentioned, and contributions to cybernetic studies made at other research institutions are summarized. D.E.R.

N64-11417 Joint Publications Research Service, Washington, D.C.

CYBERNETICS AND MEDICINE

V. Parin and D. Menitskiy 9 Dec. 1963 6 p refs Transl. into ENGLISH of an article from Med. Rabotnik (Moscow), 19 Apr. 1960 p 2
(JPRS-22189; OTS-63-41319) OTS: $0.50

The contributions of the science of cybernetics to the study of medicine in Russia are discussed. It is noted that cybernetic techniques are being used for the protection of the health of the population, and to furnish automatic objective diagnostics. Other important uses of cybernetics are the making of artificial limbs and body organs, artificial breathing apparatus, the control of body processes, and simulation studies. D.E.R.

N64-11430 Joint Publications Research Service, Washington, D.C.

APPARATUS FOR CORRELATIVE ANALYSIS OF PHYSIOLOGICAL PROCESSES

L. N. Mishin 25 Apr. 1963 12 p Transl. into ENGLISH of an article from Med. Prom. SSSR (Moscow), no. 2, 1963 p 43-48
(JPRS-18899; OTS-63-21673) OTS: $0.50

The random character of the physical processes which accompany the vital activities of an organism has been studied using a correlometer. Such processes as the electrical activity in the organism, the acoustic phenomena associated with pulmonary and cardiovascular activity, the mechanical shifting of vital organs, their hyperemia, etc., can be objectively determined; and their correlative function can be calculated by receiving an electrical signal of these functions, delaying the signal in time, multiplying the signal, integrating it with other body signals, and indicating the value of the correlative function. The design of such an instrument complex is explained. The complex records the data on tape with at least two recording channels for periodic and random processes. D.E.R.

N64-11432 Joint Publications Research Service, Washington, D.C.

EFFECTIVENESS OF ANTIHISTAMINES IN ANESTHESIOLOGY

D. G. Tagdisi 27 Nov. 1963 14 p refs Transl. into ENGLISH of an article from Azerb. Med. (Baku), no. 9, Sep. 1963 p 3-11
(JPRS-22058; OTS-63-41246) OTS: $0.50

Experiments have determined the role and mechanisms of histamine and antihistamine in the appearance and elimination of pain sensitivity, respectively. The effect of these drugs on reflex reaction time, on local conduction of nerve impulses, and their effect as anesthetics, have also been investigated. From these experiments, it is concluded that the antihistamine, Dimedrol, has practical significance in anesthesiology and in dealing with general and local disturbances of organisms arising in response to trauma and the effects of shock. D.E.R.

N64-11433 Joint Publications Research Service, Washington, D.C.

COMBINED ACTION OF NEUTRON IRRADIATION AND ELEVATED TEMPERATURE ON ANIMALS

A. F. Gur'yev 29 Jul. 1963 9 p refs Transl. into ENGLISH of an article from Gigiyena i Sanit. (Moscow), v. 38, no. 5, May 1963 p 24-29
(JPRS-20379; OTS-63-21396) OTS: $0.50

Experiments with rabbits have shown the effect of keeping animals at an elevated ambient-air temperature after massive whole-body X-irradiation in doses on the order of 250 to 600 r. Results show that the elevated temperatures increase the severity of acute radiation sickness. Rabbits also were given doses of fast-neutron irradiation from a polonium-beryllium source. These results show that the changes in certain red and white blood cell indices and the blood coagulation system are more marked when the animals are subjected to combined irradiation and high ambient-air temperatures. Such exposure also intensifies the development of radiation injuries (burns) from fractionated fast-neutron irradiation. The work was conducted mainly to study the hygienic conditions of work with radioactive materials in the petroleum industry. D.E.R.

N64-11436* Minnesota U., Minneapolis

CONTINUOUS PROPAGATION OF MICROORGANISMS

A. G. Fredrickson and H. M. Tsuchiya Repr. from A. I. Ch.E. July 1963 p 459-468 refs
(NASA Grant NsG-79-60)

Microorganisms undergo a cycle of maturation during their lifespan in a proliferating culture. This gives rise to a distribution of degrees of cellular maturation in the culture. The gross rate of any metabolic process carried on by the culture is therefore an average over all degrees of maturation present. Equations embodying the life-cycle concept are developed for cultures of organisms which proliferate by binary fission and do not form spores. The equations are solved for the age distribution in the special case of a continuous, steady-state fermentation. Expressions for calculating gross metabolic rates and cell size distributions are derived. The stability of the steady-state fermentor is discussed. Author

17 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control, and materials fabrication, handling and inspection. *For related information see*: 06 Auxiliary Systems.

N64-10825 Pratt and Whitney Aircraft, Middletown, Conn.
DESIGN SUMMARY REPORT OF LCRE PRIMARY COOLANT PUMPS AND SUMP
C. Ferguson et al 22 Nov. 1963 56 p refs
(Contract AT(30-1)-2789)
(PWAC-383) OTS: $1.25

This report covers all work accomplished in the design phase, including analytical design studies. The subject pump (designated LP-1) was designed as a ground test reactor coolant pump to circulate lithium at 1600° F for 1000 hours, and to operate at a reduced temperature of 1000° F for 10,000 hours without maintenance. All components in contact with lithium are fabricated of Cb-1 Zr alloy, whereas, the remaining components are predominantly type 316 stainless steel. Author

N64-10842 Joint Publications Research Service, Washington, D.C.
THE CONTROLLING MATHEMATICAL MACHINE "STAL' 1" FOR LAYING OUT WITHOUT WASTE
V. I. Loskutov 26 Jul. 1963 11 p Transl. into ENGLISH from Stal' (Moscow), no. 6, 1963 p 533–536
(JPRS-20344; OTS-63-31378) OTS: $0.50

The application of an electronic computer for controlling the work of cutters in two billet mills has considerably decreased losses in the material of nonuniform billet ends. The machine determines the required length of the laminate by means of impulses from photoheads; it calculates the number of billets of required nominal length which can be obtained from this laminate; calculates the length of nonuniform ends, and introduces a correction for the length of sheared billets (with permissible tolerance) by reducing the ends to the uniform length. An automatic evaluation of the theoretical weight of production is also provided. Author

N64-11012 Joint Publications Research Service, Washington, D.C.
A NEW METHOD OF MANUFACTURING RODS MADE OF REFRACTORY COMPOUNDS
V. V. Pen'kovskiy and G. V. Samsonov *In its* Soviet Res. in Powder Metal Mater. 28 Feb. 1963 p 16–21 refs (See N64-11007 02-01)

A description is given of a method for making cores from refractory compounds or mixtures of these compounds. The method consists of pressing the preparations without vacuuming the mass. An alcoholic solution of bakelite is used as a plasticizer. In the use of this method, the carburization of the material of the rods, at the expense of the coking of the bakelite, must be taken into consideration. R.T.K.

N64-11013 Joint Publications Research Service, Washington, D.C.
PRODUCTION OF NITRIDES OF REFRACTORY METALS
G. V. Samsonov, T. S. Verkhoglyadova, M. M. Antonova, and T. V. Dubovik *In its* Soviet Res. in Powder Metal Mater. 28 Feb. 1963 p 22–26 refs (See N64-11007 02-01)

Optimum methods were established for producing nitrides of titanium, tantalum, niobium, and chromium. R.T.K.

N64-11101* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTRICAL AND DIAGNOSTIC ASPECTS OF ELECTROHYDRAULIC AND MAGNETIC FORMING
R. J. Schwinghamer 18 Jun. 1963 48 p refs
(NASA TM X-51149; MTP-ME-63-2) OTS: $4.60 ph, $1.64 mf

Pertinent data and comparisons of the exploding bridge-wire-type loads used in electrohydraulic forming versus the inductive coil loads associated with magnetic forming are provided, and appropriate mathematical relationships noted. Specialized diagnostic techniques useful in both methods of forming are discussed. Examples of capabilities are shown. Author

N64-11129 Joint Publications Research Service, Washington, D.C.
THE PRODUCTION OF PIPE IN THE USSR
V. L. Agre et al 17 Jun. 1963 163 p refs Transl. into ENGLISH of portions of a book "Tekhnicheskiy progress v chernoy metallurgii SSSR: Prokatnoye i trubnoye proivodstvo", Moscow, State Publ. House for Sci. and Tech. Lit. on Ferrous and Non-Ferrous Metals, 1962 p 121–245
(JPRS-19703; OTS-63-22049) OTS: $3.00

Discussed in this report are: (1) general data on the production of steel pipes in the U.S.S.R., (2) production of hot-rolled seamless pipes, (3) production of pipes by cold rolling and cold drawing, (4) production of welded and brazed pipe, and (5) corrosion-resistant coverings for pipes. R.T.K.

N64-11162 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ELECTROEROSION MACHINING OF METALS (SELECTED CHAPTERS)
Ye. M. Levinson 19 Sep. 1963 118 p Transl. into ENGLISH from the book "Elektroyerozionnaya Obrabotka Metallov" Leningrad, Lenizdat, 1961 p 5–19, 63–97, 127–180
(FTD-TT-63-103/1+2; AD-422443)

A discussion is presented of basic information, equipment, and technology for electroerosion machining of metals. R.T.K.

N64-11185 Alloyd Electronic Corp., Cambridge, Mass.
A STUDY OF ELECTRON BEAM WELDING Final Summary Report
S. S. White Watertown, Mass., Watertown Arsenal Labs., Nov. 1962 209 p refs
(Contract DA-19-020-ORD-5484)
(WAL-401.54/2-5; AD-407313)

The electron-beam welding gun has been successfully used to effect a nonmelting, postheat treating pass embracing only fusion and high-temperature heat-affected zones. The technique has been applied to five titanium sheet rolling alloys, several types of high-strength steel, molybdenum and molybdenum–1/2 titanium alloy, all in 1/8 in. thickness. Depending on the material and its condition of heat treatment, a postheat treatment can be designed to match fusion zone and base metal in terms of strength, strain, modulus, and impact resistance. For some materials, as-welded properties could be increased in value to above those of the unwelded condition. Author

N64-11205 Los Alamos Scientific Lab., N. Mex.
COMPACTION AND SINTERING OF PuO_2-TYPE 302B STAINLESS STEEL POWDER MIXTURES
W. C. Pritchard, K. A. Johnson, and J. A. Leary 12 Nov. 1963 45 p refs
(Contract W-7405-eng-36)
(LAMS-2898) OTS: $1.00

The effects of compaction pressures, sintering temperatures, and PuO_2 preparation methods on pellets of type 302-B stainless steel and PuO_2 powders, and mixtures of these, were investigated. The pellets were compacted at pressures of 20 to 100 tsi followed by sintering in argon at temperatures of 1175° to 1680° C. Densities, composition, and the effect of a binder are correlated with the results of metallographic examination. Definite evidence of a reaction between PuO_2 and type 302-B stainless steel was obtained. The effect of the addition of 3 w/o of type 302-B stainless steel to Mo-PuO_2 pellets was also investigated. Author

N64-11212 Joint Publications Research Service, Washington, D.C.
A METHOD OF BRIQUETTING ALUMINUM POWDER
V. A. Shelamov 18 Mar. 1963 12 p refs Transl. into ENGLISH of an article from Izv. Vysshikh Uchebn. Zavedenii, Isvet. Met. (Dzandyhikau), no. 1, 1961 p 134–139
(JPRS-18186; OTS-63-21348) OTS: $0.50

Results are presented of studies concerned with the development of new methods for preparation of aluminum-powder briquettes for subsequent processing into finished products. A comparison of the values of density and hardness of the briquettes prepared by different methods shows that the maximum values of these qualities are obtained in briquettes using the higher temperatures. The best of the methods involving cold briquetting is a method utilizing metal liners. R.T.K.

N64-11237* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH SPEED VACUUM PERFORMANCE OF GOLD PLATED MINIATURE BALL BEARINGS WITH VARIOUS RETAINER MATERIALS AND CONFIGURATIONS
Harold E. Evans and Thomas W. Flatley Washington, NASA Dec. 1963 21 p refs
(NASA TN D-2101) OTS: $0.75

Metallic film lubrication of ball bearings is a possible answer to the evaporation, radiation resistance, and contamination problems associated with conventional lubricants in satellite applications. The first phase of the program which evolved was directed toward finding an acceptable retainer material and configuration. Bearings were tested in small 10,000 rpm motors in a special multiport oil-free vacuum system which is described. Two retainer types—fully machined retainers of S-Inconel and silver plated Circle C—proved outstanding and capable of providing about 1000-hours life in conjunction with gold plated balls and races. Author

N64-11244 Pratt and Whitney Aircraft, Middletown, Conn.
DESIGN SUMMARY REPORT OF LCRE REFLECTOR COOLANT PUMPS AND SUMP
C. Ferguson et al 16 Dec. 1963 43 p refs
(Contract AT (30-1)-2789)
(PWAC-384) OTS: $1.00

This pump (designated RP-1) incorporated the design features of a flight-type coolant pump for a nuclear aircraft powerplant. The RP-1 pump and sump unit was designated for use in the Lithium Cooled Reactor Experiment (LCRE), to circulate 700° F NaK (22 percent Na–78 percent K), designated NaK-78, for 10,000 hours without maintenance. All components in contact with NaK are fabricated of type 316 stainless steel. Author

N64-11303 Battelle Memorial Inst., Columbus, Ohio
INVESTIGATION OF FABRICATION TECHNIQUES FOR TUBULAR FUEL ELEMENTS
E. S. Hodge, R. J. Carlson, and E. G. Smith, Jr. 28 Oct. 1963 41 p
(Contract W-7405-eng-92)
(BMI-1652) OTS: $1.00

Two distinct techniques were considered in preliminary studies to develop fabrication techniques for producing low-cost tubular fuel elements: (1) the assembly, consolidation, and bonding of concentric components; (2) the joining together of flat fuel sheets containing several parallel fuel cores and the subsequent expansion of these cores into parallel tubes. The concentric-component technique was most successful, and tubular fuel elements 3/4 in. in diameter and 27 in. long were made by this process. These elements possessed dense cores and exhibited almost complete core-cladding bonding where explosive sizing and gas-pressure bonding were used to produce an integral element. Author

N64-11370 Cornell Aeronautical Lab., Buffalo, N.Y.
PROJECT NEOS: A GENERAL STUDY OF PROCESSES FOR THE REALIZATION OF DESIGN CONFIGURATIONS IN MATERIALS Fifth Interim Technical Report, 3 Apr.–3 Oct. 1963
Paul Rosenthal Wright-Patterson AFB, Ohio, Mfg. Tech. Div., Oct. 1963 112 p refs
(Contract AF 33(600)-42921)
(CAL-NM-1559-P-5; AD 421960; ASD-IR-5)

The studies of the four process categories (material removal, addition, displacement, and modification) continued along two lines: (1) Experiments to validate new process concepts were performed and experiment designs were formulated for material removal processes based on rapid oxidation, severe embrittlement, and cavitation erosion. (2) Studies of fundamental principles that may play a role in future processes were continued, with emphasis on the role of diffusion and sintering in certain categories of material addition processes. Highlights of the report are the development of a quantitative measure of brittleness that will be useful in evaluating embrittlement machining schemes, and initiation of quantum-mechanical studies of material behavior that will be applicable to manufacturing research. Author

N64-11409 National Aeronautical Lab., Bangalore (India)
DESIGN AND FABRICATION OF THE AIR RECEIVERS OF THE UNITARY AIR STORAGE SYSTEM OF THE NATIONAL AERONAUTICAL LABORATORY
M. V. V. Murthy, K. Venkatachalam, K. N. Raju, A. N. Kumar, and C. G. Gupte et al Jun. 1963 68 p refs
(NAL-TN-AE-17-63)

The design incorporates a four-vessel complex of about 275-m total length and 3.66-m diameter and conical ends of special design. In addition, an auxiliary receiver of the same diameter and 30.5-m length has been provided for operating a number of laboratory blowdown facilities. Author

N64-11419 Joint Publications Research Service, Washington, D.C.
ELECTROSLAG REMELTING
B. I. Medovar et al 10 Dec. 1963 193 p refs Transl. into ENGLISH of a book "Elektroshlakovyy Pereplav", Moscow, 1963 p 1-171
(JPRS-22217; OTS-63-41334) OTS: $3.00

The book describes a new method of producing especially high quality metal—electroslag remelting of steel and alloys. Numerous data are cited on the quality of the metal obtained. Author

N64-11420* IIT Research Inst., Chicago, Ill. Technology Center
PROTECTIVE COATINGS FOR REFRACTORY METALS IN ROCKET ENGINES Summary Report, 9 Mar. 1962-8 Mar. 1963
1 Oct. 1963 97 p refs
(NASA Contract NAS7-113)
(NASA CR-52871; IITRI-B237-12) OTS: $8.60 ph, $3.11 mf

This program is directed toward the development of protective coatings for use on tungsten in low-pressure radiation-cooled rocket engines at temperatures above 3600° F. Primary emphasis has been on the investigation of refractory inorganic compounds and composite oxide–refractory metal coating systems. Nitride and carbide coatings were pyrolytically deposited. The composite oxide–metal coatings were produced by plasma spraying and by wet slurry application techniques. In addition, improved silicide coatings and other metal–intermetallic compound systems have been investigated for potential usefulness above 3600° F. The most promising systems, based on high-temperature stability in an oxidizing environment, are composite coatings consisting of layers of HfO_2–Y_2O_3 or $SrZrO_3$ with tungsten produced by plasma spraying. Author

18 MATERIALS, METALLIC

Includes cermets; mechanical and physical properties of alloys and metals; and metallurgy. *For related information see*: 07 Chemistry; 17 Machine Elements and Processes; 19 Materials, Nonmetallic; 33 Stresses and Loads; and 34 Structural Design.

N64-10670 Joint Publications Research Service, Washington, D.C.
PHYSICAL PROPERTIES OF METALLOID COMPOUNDS
V. S. Neshpor (Inst. of Metal Ceramics and Special Alloys) *In its* Works on Heat-Resisting Materials, USSR 1960 p 3-29 refs (See N64-10669 02-01) OTS: $2.75

The metalloid compounds include borides, carbides, nitrides, and silicides of the transition elements (with closed electron d- and f-levels). This report contains physical properties of the following transition elements and their borides, carbides, nitrides, and silicides: titanium, zirconium, hafnium, vanadium, niobium, tantalum, molybdenum, and tungsten. The physical properties include: microhardness, the modulus of elasticity, the modulus of dislocation, characteristic temperature, the amplitude of heat variation at normal temperature, the bonding energy, and the coefficient of expansion. I.v.L.

N64-10671 Joint Publications Research Service, Washington, D.C.
THE $L_{\beta2}$ AND $L_{\gamma1}$ EMISSION BANDS OF COLUMBIUM IN CbN, CbC AND CbB_2
M. I. Korsunskiy and Ya. E. Genkin (Khor'kov Polytech. Inst.) *In its* Works on Heat-Resisting Materials, USSR 1960 p 30-43 refs (See N64-10669 02-01)

The L-series of niobium was investigated in the compounds NbN, NbC, and NbB_2 by means of X-ray spectroscopy. Results indicate that: (1) The intensity and shape of the lines $L\alpha_{1,2}$, $L\beta_1$, $L\beta_3$, $L\beta_4$, and so on, changed a little; however, the intensity and shape of lines $L\beta_2$ and $L\gamma_1$ underwent a sharp change. (2) Lines $L\beta_2$ and $L\gamma_1$ of Nb in the compounds are only parts of the corresponding lines of pure Nb. (3) The conducted measurements are not sufficiently accurate for reliable quantitative conclusions; however, undoubtedly in the case of Nb, the departure of the d-states in compound NbB_2 is larger than in NbN and NbC. I.v.L.

N64-10674 Joint Publications Research Service, Washington, D.C.
CODIFFUSION OF TWO ELEMENTS INTO HARD METAL
V. I. Arkharov and V. N. Konev (Urslak State U.) *In its* Works on Heat-Resisting Materials, USSR 1960 p 80-94 refs (See N64-10669 02-01) OTS: $2.75

The co-diffusion of two elements into a third is examined in systems of the type of a hard metal and two chemically active gases. In the case of co-diffusion of carbon and nitrogen into chromium, N_2 and C participated simultaneously in the process of diffusion into Cr. On the surface of Cr, phases of the chromium carbide type (Cr_3C_2, Cr_7C_3) are formed with changed parameters, which indicate the solution of N_2 in these phases. Under the carbide layers, the roentgenographic and metallographic examinations found the Cr_2N phase. Consequently, the front of N_2 diffusion is more quickly changing place than the carbon front, by penetrating deep into the metal and forming a nitride phase. In the case of chromium oxide in the air, N_2 will also participate in the process of the reaction diffusion of O_2 into Cr. On the surface of Cr, Cr_2O_3 is formed. Under this layer, the layer of hexagonal Cr_2N is found. The front of N_2 diffusion is transferred into the depth quicker than that of O_2. The N_2 diffusion takes place through the oxide layer into the metal, forming a nitride layer between the oxide layer and the metal. I.v.L.

N64-10681 Joint Publications Research Service, Washington, D.C.
ALUMINUM PLANT DESIGN
P. K. Aver'yanov et al 5 Feb. 1963 15 p Transl. into ENGLISH of 3 articles from Montazhnyye i Spetsializirovannyye Raboty v Stroitel'stve (Moscow), no. 11, Nov. 1962 p 4-12
(JPRS-17484) OTS: $0.50

Aluminum plant design is discussed with respect to: (1) assembly of aluminum plant structures, (2) progressive methods of electrolyzer assembly in the aluminum industry, and (3) heavy leads in aluminum electrolysis. P.V.E.

N64-10685 Joint Publications Research Service, Washington, D.C.
SOVIET STUDIES ON POWDER METALLURGY
6 Feb. 1963 45 p refs Transl. into ENGLISH of four articles from a book "Issledovaniya po zharoprochnym splavam", v. 4, (Moscow), Publishing House of the Acad. of Sci. USSR, 1959 p 301-322; 352-359
(JPRS-17499; OTS-63-21061) OTS:$1.25

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2. CERTAIN PROBLEMS ON THE THEORY OF SINTERING AND CREEP M. Yu. Bal'shin p 14–22 refs (See N64-10687 02-18)

3. PROPERTIES OF CHROMIUM CARBIDES AND POWDER METAL ALLOYS ON THEIR BASE V. V. Gregor'yeva and V. N. Klimenko p 23–31 refs (See N64-10688 02-18)

4. PRODUCTION OF POWDERS OF ALLOYS BY THE METHOD OF DIFFUSION SATURATION I. M. Fedorchenko and N. A. Filatova p 32–42 refs (See N64-10689 02-18)

N64-10686 Joint Publications Research Service, Washington, D.C.

INVESTIGATION OF DIFFUSION CREEP IN POWDER METAL BODIES

B. Ya. Pines and A. F. Sirenko *In its* Soviet Studies on Powder Met. 6 Feb. 1963 p 1-13 refs (See N64-10685 02-18) OTS: $1.25

Creep processes were investigated in metal samples prepared from the compression of metal powders. The general course of deformation change with time at high temperatures and low loads was found to resemble that of solid samples; first, a stage of unsteady creep was observed, then a stage of steady creep with a constant deformation rate. The effects of variables such as annealing time, initial porosity and particle size, stretching, external pressure, and composition (pure metal powder vs. mixtures of metal powders) were examined. The activation energies for the creep processes were found to differ from those for volumetric autodiffusion (viscous flow), and diffusion creep mechanisms are considered to be the only explanation for the observed results. M.P.G.

N64-10687 Joint Publications Research Service, Washington, D.C.

CERTAIN PROBLEMS ON THE THEORY OF SINTERING AND CREEP

M. Yu. Bal'shin *In its* Soviet Studies on Powder Met. 6 Feb. 1963 p 14-22 refs (See N64-10685 02-18) OTS: $1.25

The four laws common to all deformation processes are developed for sintering, since sintering is a process of deformation due to forces of surface tension. Factors influencing the sintering rate are also discussed. M.P.G.

N64-10688 Joint Publications Research Service, Washington, D.C.

PROPERTIES OF CHROMIUM CARBIDES AND POWDER METAL ALLOYS ON THEIR BASE

V. V. Grigor'yeva and V. N. Klimenko *In its* Soviet Studies on Powder Met. 6 Feb. 1963 p 23–31 refs (See N64-10685 02-18) OTS: $1.25

The properties of chromium carbides and powder metal alloys based on chromium carbides are reviewed. Conditions are established for producing Cr_3C_2 and Cr_7C_3 suitable for the manufacture of powder metal alloys. The hardness of chromium carbide at temperatures from 500° to 1100° was found to exceed the hardness of titanium carbide. The hardness and bending strength of alloys made with increased Cr_7C_3 content were found to increase at high temperatures, and to exceed the hardness and bending strength of alloys based on Cr_3C_2 at corresponding high temperatures. M.P.G.

N64-10689 Joint Publications Research Service, Washington, D.C.

PRODUCTION OF POWDERS OF ALLOYS BY THE METHOD OF DIFFUSION SATURATION

I. M. Fedorchenko and N. A. Filatova *In its* Soviet Studies on Powder Met. 6 Feb. 1963 p 32–42 refs (See N64-10685 02-18) OTS: $1.25

Diffusion saturation was performed on sponge prepared from pure powders of nickel, iron, and molybdenum and from powdered nickel–molybdenum alloy. Using these highly porous sponges, powder alloys of complex chemical composition were produced in a layer up to 10- to 30-mm thick by the method of chemicothermal diffusion saturation of active fills or of a gas phase. The chemicothermal diffusion saturation method was found to be highly satisfactory for the production of powder metal alloys of iron, nickel, molybdenum, or other metals with metals possessing hard-to-reduce oxides such as chromium, aluminum, and titanium. Alloys produced by this method possessed adequate uniformity for practical engineering use. Another advantage of the chemicothermal process is the simultaneous refinement of the starting material. M.P.G.

N64-10704 Joint Publications Research Service, Washington, D.C.

CORROSION OF REINFORCEMENT STEEL IN POROUS CONCRETE

P. Melenevs'ka 13 Feb. 1963 6 p Transl. into ENGLISH from Budivel'ni Materialy i Konstruktsii (Kiev) v. 4, no. 4, 1962 p 13-15

(JPRS-17616; OTS-63-21125) OTS: $0.50

The effectiveness of various protective coatings on steel rods used for concrete reinforcement is discussed. Sample blocks were prepared which contained rods with and without protective coatings (the steel rods to be protected were phosphated, neutralized, and covered with lacquer coatings). The samples were subjected to thermohumidity processing in a vapor chamber, aeration by a blower, and subjection to hydrochloric acid vapor and sulfurous anhydride. Good results were obtained with phosphation of the steel rods followed by coating with Kuzbas lacquer. Tests made on the strength of bonding of the concrete to the steel rods indicated that phosphated rods coated with Kuzbas lacquers were bonded to the concrete more strongly than the unprotected rods. P.V.E.

N64-10705 Joint Publications Research Service, Washington, D.C.

SOVIET RESEARCH IN RARE METAL INDUSTRY

14 Feb. 1963 29 p refs Transl. into ENGLISH of two articles from the book "Zavodskaya Laboratoriya", no. 4, (Moscow), Publ. House of the Acad. of Sci. USSR, 1962 p 459–462; 450–458

(JPRS-17638; OTS-63-21136) OTS: $0.75

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1. ON A METHOD OF EXPOSING DISLOCATIONS IN SILICON MONOCRYSTALS M. G. Mil'vidskiy and L. V. Layner p 1–7 refs (See N64-10706 02-18)

2. METHODS OF EXPOSING DISLOCATIONS IN CRYSTALS I. A. Oding and E. S. Kosyakina p 8–26 refs (See N64-10707 02-18)

N64-10706 Joint Publications Research Service, Washington, D.C.

ON A METHOD OF EXPOSING DISLOCATIONS IN SILICON MONOCRYSTALS

M. G. Mil'vidskiy and L. V. Layner *In its* Soviet Res. in Rare Metal Indus. 14 Feb. 1963, p 1–7 refs, (See N64-10705 02-18) OTS: $0.75

The article discusses the method of exposing dislocations in silicon monocrystals; the method is based on thermal treatment of the specimens before chemical etching. The thermal treatment which destroys "the natural" atmosphere of impurities at dislocations increases considerably the sensitivity of the method of chemical etching for exposing dislocations, and permits its successful application in investigating the nonhomogeneous impurity distribution in monocrystals of silicon.
Author

N64-10707 Joint Publications Research Service, Washington, D.C.
METHODS OF EXPOSING DISLOCATIONS IN CRYSTALS
I. A. Oding and E. S. Kosyakina *In its* Soviet Res. in Rare Metal Indus. 14 Feb. 1963 p 8–26 refs (See N64-10705 02-18) OTS: $0.75

The following topics are elucidated with regard to exposing dislocation defects in crystal lattices: (1) application of visible-light microscopy for observation of dislocations, (2) optical methods of increased sensitivity, (3) application of phase-contrast microscopy and multibeam interferometry, (4) application of methods of electron microscopy for the study of dislocations, (5) direct observation of dislocations in thin objects, (6) a method of "Moire Fringe," (7) observa- of dislocations by the method of diffraction contrast, (8) investigation of crystalline lattices with the aid of an ionic microscope, and (9) X-ray methods of determination of imperfections of a crystal lattice. Optical microscope and etching techniques are utilized for the study of distribution of dislocations on the surface of massive objects. X-ray methods of exposing dislocations are utilized basically for the study of distribution of dislocations through the volume of the specimen. Electron microscopy allows the observation of the motion of dislocations, their interactions, defects of density, etc.
P.V.E.

N64-10715 Joint Publications Research Service, Washington, D.C.
ELECTROLYTIC METHOD OF PRODUCING TANTALUM
Yu. I. Ostroushko, G. A. Meyerson, and R. B. Shtrapenina 19 Feb. 1963 15 p refs Transl. into ENGLISH from Tsvetn. Metal. (Moscow), no. 12, Dec. 1958 p 38–44
(JPRS-17729; OTS-63-21174) OTS: $0.50

Conditions were established for the production of pure tantalum powder suitable for the production of ductile metal by the electrolysis of molten mixtures of the eutectic NaCl + KCl (67% to 70%), K_2TaF_7 (25% to 30%), and Ta_2O_5 (3% to 3.5%). This electrolyte differs from those described in the literature by the absence of potassium fluoride, a low melting point (600°), and a high fluidity which aids in the removal from the electrolyte of the tantalum powder when unloading the bath. The electrolyte is not very volatile at the electrolysis temperature (about 700°) and is marked by low corrosivity toward the nickel used in the structure of the cell. The influence of the variable electrolysis factors (current density, temperature, electrolyte composition) on the granulometric composition of the tantalum powder, on yield, and on current density was investigated. The conduct of the impurities during the electrolysis of tantalum was studied.
Author

N64-10727 Joint Publications Research Service, Washington, D.C.
SOVIET EXPERIMENTAL ELECTROLYTIC AND AUTOCLAVE PRODUCTION OF RHENIUM POWDER
A. N. Zelikman et al 5 Mar. 1963 33 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Tsvet. Met. (Dzaudzhikau), 1961
(JPRS-17937; OTS-63-21243) OTS: $1.00

CONTENTS:

1. INVESTIGATION OF THE AUTOCLAVE METHOD OF PRODUCING RHENIUM FROM POTASSIUM PERRHENATE A. N. Zelikman et al p 1–21 refs (See N64-10728 02-19)
2. USE OF VARIABLE POLARITY CURRENT IN THE ELECTROLYTIC PRODUCTION OF RHENIUM POWDER S. I. Skylyarenko et al p 22–30 refs (See N64-10729 02-19)

N64-10730 Joint Publications Research Service, Washington, D.C.
THE EFFECT OF HYDROGEN ON STRUCTURAL TRANSFORMATIONS IN TITANIUM ALLOYS
N. I. Blok, A. I. Glazova et al 7 Mar. 1963 15 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Otd. Tekhn. Nauk: Met. i Gornoye Delo (Moscow), no. 12, 1958 p 96–99
(JPRS-17990; OTS-63-21264) OTS: $0.50

The effect of hydrogen on the plastic properties of alpha-, alpha- plus beta-, and beta-titanium alloys is discussed. In alpha-titanium alloys, hydrogen is found to cause embrittlement during mechanical testing at high speed. In the two-phase solid-solution alloys, the hydrogen embrittlement is noticed at low speeds. However, in beta-titanium alloys, the embrittlement effect of hydrogen is considerably lessened at all speeds. In studies on VT3 and VT3-1 alloys, the beta-phase titanium has been found to be decomposed by 0.05% hydrogen on heating, but stabilized by 0.12% hydrogen.
D.E.R.

N64-10745 Joint Publications Research Service, Washington, D.C.
STUDY OF PROBLEMS ON SURFACE PHENOMENA IN METALS AND ALLOYS
15 Mar. 1963 39 p refs Transl. into ENGLISH of three articles from Fiz. Metal. i Metalloved. (Sverdlovsk), v. 14, no. 5, Nov. 1962 p 687–692; 745–749; 783–784
(JPRS-18154; OTS-63-21333) OTS: $1.00

CONTENTS:

1. INVESTIGATION OF DISLOCATION STRUCTURE IN ZINC CRYSTALS BY THE METHOD OF SELECTIVE ETCHING A. A. Predvoditelev, G. V. Bushuyeva, and V. M. Stepanova p 1–19 refs (See N64-10746 02-18)
2. MICROSCOPIC STUDY OF THE DEFORMATION OF ORDERED ALLOYS V. I. Syutkina and E. S. Yakovleva p 20–30 refs (See N64-10747 02-18)
3. PROBLEM CONCERNING THE MAGNITUDE OF THE ENERGY OF PACKING DEFECTS IN LEAD L. M. Butkevich, P. A. Kondrat'yev, and M. A. Bol'shanin p 31–35 refs (See N64-10748 02-18)

N64-10746 Joint Publications Research Service, Washington, D.C.
INVESTIGATION OF DISLOCATION STRUCTURE IN ZINC CRYSTALS BY THE METHOD OF SELECTIVE ETCHING
A. A. Predvoditelev, G. V. Bushuyeva, and V. M. Stepanova *In its* Study of Probl. on Surface Phenomena in Metals and Alloys 15 Mar. 1963 p 1–19 refs (See N64-10745 02-18)

Work was devoted to an investigation of the dislocation structure formed during the growth and development of zinc crystals. The method of layer by layer polishing and etching was employed in the investigation. Investigated was the development of: (1) dislocation structure during growth, and (2) twin structure and dislocation structure arising during the action of point load.
C.L.W.

N64-10747 Joint Publications Research Services, Washington, D.C.

MICROSCOPIC STUDY OF THE DEFORMATION OF ORDERED ALLOYS

V. I. Syutkina and E. S. Yakovleva *In its* Study of Problems on Surface Phenomena in Metals and Alloys 15 Mar. 1963 p 20-30 refs (See N64-10745 02-18)

Slip traces on copper–gold and copper–palladium alloys in conditions of order and disorder were studied microscopically. A sharp difference in the pattern of the slip traces was obtained. A change in the character of shear was explained from the point of view of dislocation theory. Author

N64-10748 Joint Publications Research Service, Washington, D.C.

PROBLEM CONCERNING THE MAGNITUDE OF THE ENERGY OF PACKING DEFECTS IN LEAD

L. M. Butkevich, P. A. Kondrat'yev and M. A. Bol'shanin *In its* Study of Probl. on Surface Phenomena in Metals and Alloys 15 Mar. 1963 p 31–35 refs (See N64-10745 02-18)

In the theory of divided dislocations in metals with face centered cubic lattices, the value of the energy of the packing defect γ is introduced. Partial dislocations, which are divided at planes with screw dislocations, are connected by packing defects which lead to a decrease of the packing energy of dislocation. Experimental evaluation of the energy of packing defects is discussed. C.L.W.

N64-10750 Joint Publications Research Service, Washington, D.C.

BRAZING AND WELDING SINTERED ALUMINUM POWDER

Yu. V. Dmitriyev et al 18 Mar. 1963 26 p refs Transl. into ENGLISH of two articles from Svarochnoye Proizvodstvo (Moscow), no. 11, 1961 p 7–13
(JPRS-18187; OTS-63-21349) OTS: $0.75

Investigations were conducted using sheet material of SAP (sintered aluminum powder). The possibility of obtaining welded bonds of SAP sheets was demonstrated, and the technique for spot welding was developed. The technology for the cladding of SAP with various aluminum alloys is described. A method for spot and seam welding of SAP sheets was developed; the welded bonds of the clad SAP have high strength at room and at elevated temperatures. Results are also presented from investigations on the brazing of SAP materials, using zinc and aluminum solder, by the abrasion, gas flame, and electrocontact methods. R.T.K.

N64-10766 Joint Publications Research Service, Washington, D.C.

METAL POWDERS AND WELDING

1 Apr. 1963 19 p refs Transl. into ENGLISH of two articles p 13–15, 71–76
(JPRS-18465; OTS-63-[illegible]465) OTS: $0.50

CONTENTS:

1. CERTAIN PROBLEMS ON THE WELDING OF METAL POWDERS L. A. Mel'nikov p 1–8 refs (See N64-10767 02-18)

2. POWDER-PLATE ELECTRODE FOR ELECTROSLAG FACING A. Ya. Shartser, I. Ya. Golub, and G. V. Lugovaya p 9–16 refs (See N64-10768 02-18)

N64-10767 Joint Publications Research Service, Washington, D.C.

CERTAIN PROBLEMS ON THE WELDING OF METAL POWDERS

L. A. Mel'nikov *In its* Metal Powders and Welding 1 Apr. 1963 p 1–8 refs Transl. into ENGLISH from Svarochnoye Proizvodstvo, (Moscow), no. 11, Nov. 1962 p 13–15 (See N64-10766 02-18) OTS: $0.50

Iron powders of various granulations, as well as powders of tungsten, nickel, tin, lead, titanium, aluminum, and certain ferroalloys were welded. The possibility of welding metallic powders, permitting the creation of a broad range of alloys in the weld seam (including cermets) with extremely varied properties, was demonstrated. The welding of powders was accomplished simultaneously with the process of their being welded to the surface of a metal. R.T.K.

N64-10768 Joint Publications Research Service, Washington, D.C.

POWDER-PLATE ELECTRODE FOR ELECTROSLAG FACING

A. Ya. Shvartser, I. Ya. Golub, and G. V. Lugovaya *In its* Metal Powders and Welding 1 Apr. 1963 p 9–16 refs Transl. into ENGLISH from Avtomat. Svarka, (Kiev), no. 11, Nov. 1962 p 71–76 (See N64-10766 02-18) OTS: $0.50

A rigid electrode is described whose casing consists of two plates of sheet steel to which two pieces of electrode wire are welded. The space between the plates is filled with powder. A simple construction of a powder-plate electrode, guaranteeing the alloying of faced material during the electroslag process, was developed. A determination was made of the coefficients of assimilation of a number of alloying elements during the facing of the powder plate. Comparative data were obtained on the current strength during the melting of solid, hollow, and powder-plate electrodes, and the coefficient of fusion of the latter was determined. The powder charge was found to increase the electroconductivity of the plate; this increase depends on the degree of the powder packing. R.T.K.

N64-10770 Joint Publications Research Service, Washington, D.C.

ROLE OF ELECTRON BEAM AND ELECTROSLAG REFINING IN SPECIAL WELDMENTS

Ye. Paton and B. I. Medovar 2 Apr. 1963 11 p refs Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 11, Nov. 1962 p 1–7
(JPRS-18490; OTS-63-21474) OTS: $0.50

Development of electron beam and electroslag refining processes for improving the quality of steels and alloys in weldments of special uses is discussed. Electron-beam smelting under vacuum, while possessing all the advantages of electroslag remelting (ESR), due to slower sequence of crystallization of liquid metal in a water-cooled metal casting mold, surpasses ESR in such indices as degree of purification from harmful impurities and gases. A promising method of increasing the quality of steels, widely used in welding constructions, may be the combination of the electroslag welding process with continuous teeming. In those cases when carbon or alloyed steel is designated for weldments or articles of special designation, preference should be given to ESR, instead of treating liquid metal with synthetic slags. P.V.E.

N64-10785 Joint Publications Research Service, Washington, D.C.

CONTINUOUS CASTING OF STEEL

V. B. Gankin (Dnepropetrovsk Met. Inst) et al 16 Apr. 1963 24 p refs Transl. into ENGLISH of two articles from Izvest. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), no. 1, 1963 p 34–48
(JPRS-18710; OTS-63-51578) OTS: $0.75

Two articles on continuous casting of steel are presented: (1) The Mechanism of Crystallization of Rimming Steel During Continuous Casting—(a) crystallization front in a continuous ingot, (b) influence of certain factors (increase in casting rate and influence of descending flow) on ingot structure, and (c) probable mechanism of ingot formation. (2) Development of Improved Designs of Nozzles and Stopped Heads for Continuous Casting of Steel. P.V.E.

N64-10789 Joint Publications Research Service, Washington, D.C.

SOVIET REPORTS ON METALLURGY NOVEMBER– DECEMBER 1962

22 Apr. 1963 44 p refs Transl. into ENGLISH of four articles from Izv. Akad. Nauk SSSR, Otd. Tekhn. Nauk: Met. i Toplivo (Moscow), no. 6, Nov.–Dec. 1962 p 90–111
(JPRS-18817; OTS-63-21627) OTS: $1.25

CONTENTS:

1. THE ROLE OF GRAIN BOUNDARIES IN THE DEVELOPMENT OF FATIGUE V. S. Ivanova p 1–14 refs (See N64-10790 02-18)
2. DISLOCATION STRUCTURE OF SOME DEFORMED METALS AND ALLOYS L. N. Guseva and A. A. Babareko p 15–23 refs (See N64-10791 02-18)
3. THE ANNIHILATION OF VACANCIES IN THE CREEP PROCESS AS A FACTOR IN INCREASING HEAT-RESISTANCE V. N. Gulyayev p 24–32 refs (See N64-10792 02-18)
4. OBSERVATION OF DISLOCATIONS IN CAST AND DEFORMED POLYCRYSTALLINE CHROMIUM D. A. Prokoshkin, M. P. Matveyeva, and Yu. M. Platov p 33–41 refs (See N64-10793 02-18)

N64-10790 Joint Publications Research Service, Washington, D.C.

THE ROLE OF GRAIN BOUNDARIES IN THE DEVELOPMENT OF FATIGUE

V. S. Ivanova *In its* Soviet Rept. on Met. Nov.–Dec. 1962 22 Apr. 1963 p 1-14 refs (See N64-10789 02-18) OTS: $1.25

The process of fatigue fracture was found to be associated with accumulation of a critical dislocation density in localized volumes of metal (ferro-silicon). The values of critical dislocation density were calculated for iron, aluminum, and copper. R.T.K.

N64-10791 Joint Publications Research Service, Washington, D.C.

DISLOCATION STRUCTURE OF SOME DEFORMED METALS AND ALLOYS

L. N. Guseva and A. A. Babareko *In its* Soviet Rept. on Met. Nov.–Dec. 1962 22 Apr. 1963 p 15-23 refs (See N64-10789 02-18) OTS: $1.25

An X-ray diffraction method was used to appraise the dislocation structure of deformed metals and alloys. X-ray data are presented concerning the substructure of deformed crystals. These data demonstrate the varied mechanisms of the plastic flow which can be associated with the special features of the relaxation processes accompanying deformation. R.T.K.

N64-10792 Joint Publications Research Service, Washington, D.C.

THE ANNIHILATION OF VACANCIES IN THE CREEP PROCESS AS A FACTOR IN INCREASING HEAT-RESISTANCE

V. N. Gulyayev *In its* Soviet Rept. on Met. Nov.–Dec. 1962 22 Apr. 1963 p 24-32 refs (See N64-10789 02-18) OTS: $1.25

A theory is presented for the annihilation of vacancies in the process of creep. This theory is used to explain the effect of nitrogen, boron, and carbon on the heat resistance of steel. A formula is presented for determining the time of destruction of alloys under condition of tensile (creep) testing. R.T.K.

N64-10793 Joint Publications Research Service, Washington, D.C.

OBSERVATION OF DISLOCATIONS IN CAST AND DEFORMED POLYCRYSTALLINE CHROMIUM

D. A. Prokoshkin, M. P. Matveyeva, and Yu. M. Platov *In its* Soviet Rept. on Met. Nov.–Dec. 1962 22 Apr. 1963 p 33-41 refs (See N64-10789 02-18) OTS: $1.25

The microstructure of chromium fired at 1300° C is discussed. The exposed dislocations, in the chromium specimens, confirmed the theory of brittle fracture. R.T.K.

N64-10801 Joint Publications Research Service, Washington, D.C.

SOVIET REPORTS ON METALLURGY AND DISLOCATIONS

24 Apr. 1963 23 p refs Transl. into ENGLISH of two articles from Fiz. Metal. i Metalloved. Akad. Nauk SSSR (Sverdlovsk)
(JPRS-18869; OTS-63-21658) OTS: $0.75

CONTENTS:

1. STACKING FAULTS AND SEGREGATIONS IN COBALT-BASED ALLOYS Yu. A. Skakov and Yu. O. Mezhennyy p 1–10 refs (See N64-10802 02-18)
2. THE DISTRIBUTION OF IMPURITIES AND DISLOCATIONS IN CADMIUM CRYSTALS N. A. Tyapunina, A. A. Predvoditelev, V. E. Yurasova, S. M. Gusarova, and V. M. Zakharov p 11–20 refs (See N64-10803 02-18)

N64-10802 Joint Publications Research Service, Washington, D.C.

STACKING FAULTS AND SEGREGATIONS IN COBALT-BASED ALLOYS

Yu. A. Skakov and Yu. O. Mezhennyy *In its* Soviet Rept. on Met. and Dislocations 24 Apr. 1963 p 1–10 refs (See N64-10801 02-18)

The connection between the hardening of cobalt-based alloys during heat treatment and the formation of segregations near the stacking defects is discussed. Experimental conclusions are: (1) a significant quantity of stacking faults (up to 7%) appear in the process of plastic distortion (at room temperature) in the alloys investigated; carbon does not noticeably affect the probability of the appearance of faults; chromium and molybdenum facilitate the emergence of faults during distortion; (2) low-temperature annealing of distorted forms leads to hardening of the alloy due to the formation of segregations near the stacking faults; and (3) the process of separation, which is accompanied by the disappearance of stacking faults and segregations, leads to the softening of the alloy. J.E.T.

N64-10803 Joint Publications Research Service, Washington, D.C.

THE DISTRIBUTION OF IMPURITIES AND DISLOCATIONS IN CADMIUM CRYSTALS

N. A. Tyapunina, A. A. Predvoditelev, V. E Yurasova, S. M. Gusarova, and V. M. Zakharov *In its* Soviet Rept. on Mets. and Dislocations 24 Apr. 1963 p 11–20 refs (See N64-10801 02-18)

The relation of the size and shape of the geometric forms to the concentration of zinc was investigated for an explanation of the possible reasons for the appearance of two systems of corrosion forms in cadmium crystals. Electrolytic and ion bombardment methods of corrosion were utilized on a series of forms containing from 0.01% to 10% zinc. Pictorial and tabular results are presented and discussed.
J.E.T.

N64-10804 Joint Publications Research Service, Washington, D.C.
SOVIET DEVELOPMENT IN METALLURGY
24 Apr. 1963 28 p refs Transl. into ENGLISH of two articles
(JPRS-18870; OTS-63-21659) OTS: $0.75

CONTENTS:

1. THE INTERACTION OF CERTAIN BRAZES WITH SAP-1 AND AD1 ALUMINUM V. L. Grishin p 1–16 (See N64-10805 02-18)
2. PRODUCTION OF AMMONIUM PARATUNGSTATE IN ACID-FREE AUTOCLAVE SOLUTIONS K. Ya. Shapiro, Yu. M. Glebov, B. M. Tarakanov, V. V. Kulakova and Kh. Kapkayeva p 17–25 refs (See N64-10806 02-18)

N64-10805 Joint Publications Research Service, Washington, D.C.
THE INTERACTION OF CERTAIN BRAZES WITH SAP-1 AND AD1 ALUMINUM
V. L. Grishin *In its* Soviet Develop. in Met. 24 Apr. 1963 p 1–16 Transl. into ENGLISH from Svarochnoye Proizvodstvo (Moscow), no. 12, Dec. 1962 p 30–34 (See N64-10804 02-18)

Examined is the interaction of zinc- and aluminum-based brazes on AD1 and SAP-1 aluminum, under brazing temperatures of 450° to 610°. Data are given on the flow properties of the brazes on the base materials and the wetting boundary angles. Study of the degree of erosion between the braze and the aluminum at various temperatures and braze times indicates an optimal choice in thickness of braze materials
Author

N64-10806 Joint Publications Research Service, Washington, D.C.
PRODUCTION OF AMMONIUM PARATUNGSTATE IN ACID-FREE AUTOCLAVE SOLUTIONS
K. Ya. Shapiro, Yu. M. Glebov, B.M. Tarakenov, V. V. Kulakova, and Kh. Kapkayeva *In its* Soviet Develop. in Met. 24 Apr. 1963 p 17-25 refs Transl. into ENGLISH from Tsvetn. Metal. (Moscow, no. 1, Jan. 1963 p 54-57 (See N64-10804 02-18)

The production of tungsten, using ammonium paratungstate instead of tungsten anhydride, is discussed. In contrast to present methods which require a stage of acid dissociation of tungsten concentrate or synthetic scheelite, the proposed technique is acid free.
P.V.E.

N64-10815 Joint Publications Research Service, Washington, D.C.
COLD WELDING OF PLASTIC METALS
I. B. Baranov 7 May 1963 180 p refs Transl. into ENGLISH of the monograph "Kholodnaya Svarka Plastichnykh Metallov," Moscow, State Sci. Tech. Publishing House of Machine Building Lit., 1962 p 1–152
(JPRS-19103; OTS-63-21785) OTS: $3.00

Cold welding, the method of making permanent bonds based on the joint plastic deformation of the contacting metals, is discussed as follows: (1) the physical basis of the cold welding process, (2) preparation of parts for cold welding, (3) lap welding, (4) cold butt welding, (5) welding technology and fixtures, (6) copper terminals for aluminum conductors, (7) durability of aluminum–aluminum and aluminum–copper electrical contact, and (8) equipment for cold welding.
M.P.G.

N64-10816 Joint Publications Research Service, Washington, D.C.
ALL-PURPOSE LABORATORY DEVICE FOR SMELTING AND ZONE-REFINING METALS BY THE ELECTRON BEAM METHOD
A. I. Yovstyukhin et al 6 Nov. 1963 12 p Transl. into ENGLISH from the book "Razdeleniye blizkikh po svoystvam redkikh metallov" (Moscow), 1962 p 233–242
(JPRS-19147; OTS-63-21803) OTS: $0.50

Successive resmelting and casting of pure metals without contamination presents great difficulties. Smelting ingots in arc or induction furnaces leads to contamination of the metals by impurities from the crucible, the electrode, or from the environment (for smelting in an inert atmosphere). This pertains particularly to difficultly fusible and chemically active metals. Efforts to preclude contamination of the metal in resmelting and to attain more effective purification as a result of zone smelting has led to the development of a universal laboratory apparatus, in which a narrow zone of molten metal is created by a beam of electrons.
Author

N64-10837 Joint Publications Research Service, Washington, D.C.
BEHAVIOR OF RHENIUM IN MOLYBDENITE CONCENTRATES
V. I. Bibikova et al 28 Jun. 1963 14 p Transl. into ENGLISH from the publ. Reniy-Tr. Soveshch., Moscow, Acad. Sci. USSR Publishing House, 1961 p 37–41
(JPRS-19929; OTS-63-31154) OTS: $0.50

Molybdenite concentrates are characterized by a varied content of rhenium. An analysis was made of the rhenium content of various samples of molybdenite from different regions of the U.S.S.R. An increased content of rhenium was established in many molybdenite concentrates of copper–molybdenum deposits in the regions of Armenia, Kazakhstan, and Uzbekistan. Volatilization of rhenium was studied. The most complete volatilization of rhenium is effected in effervescent foil furnaces. Either a wet Cottrell filter or a velocity foam bubbler apparatus is recommended for the recovery of rhenium from the gaseous stage.
R.T.K.

N64-10846 Joint Publications Research Service, Washington, D.C.
STEEL WELDING AND WELDING EQUIPMENT
A. S. Astaf'yev et al 18 Nov. 1963 32 p refs Transl. into ENGLISH of 3 articles from Svarochnoye Proizvodstvo (Moscow), no. 5, 1963 p 6–13 and 41–44
(JPRS-21896; OTS-63-41152) OTS: $1.00

Two papers are presented on steel welding: (1) Effect of Alloying Elements on the Weldability of High-Strength Steels—the results of an investigation of the influence of various contents of C, Mn, Si, Cr, and V on the weldability of high-strength armature steel with a beinite structure, and (2) Electroslag Welding of the Austenitic-Ferritic Steel—the technology of the electroslag welding of the austenitic-ferritic steel has been developed, using plate and wire electrodes, as well as a melting tip; systems of welding and heat treatment are presented, along with the results of mechanical tests and metallographic investigations of the welded joints.
P.V.E.

N64-10847 Joint Publications Research Service, Washington, D.C.

STEEL PRODUCTION BY ELECTROSLAG REMELTING

G. A. Khasin et al 19 Nov. 1963 21 p refs Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 9 (126), Sep. 1963 p 78–81 and Stal' (Moscow), no. 9, Sep. 1963 p 805–809 (JPRS-21912; OTS-63-41161) OTS: $0.50

CONTENTS:

1. PRODUCTION OF STEELS EI-736 AND EI-961 BY ELECTROSLAG REMELTING G. A. Khasin et al p 1–5 (See N64-10848 02-18)
2. ELECTROSLAG REMELTING OF HEAT-RESISTANT STAINLESS STEELS V. V. Topilin et al p 6–18 refs (See N64-10849 02-18)

N64-10848 Joint Publications Research Service, Washington, D.C.

PRODUCTION OF STEELS EI-736 AND EI-961 BY ELECTROSLAG REMELTING

G. A. Khasin, G. A. Vachugov, P. P. Menushenkov, L. I. Posysayeva (Zlatoustovsk Met. Plant), B. I. Medovar (Acad. Sci Ukr. SSR) et al *In its* Steel Production by Electroslag Remelting 19 Nov. 1963 p 1–5 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 9 (126), Sep. 1963 p 78–81 (See N64-10847 02-18) OTS: $0.50

The purpose of this work was to develop electroslag remelting (ESR) of brands EI-736 and EI-961 steels in crystallizers 425 mm in diameter, as well as to study the influence of the crystallizer diameter and chemical composition of the flux on the quality of the metal. Author

N64-10849 Joint Publications Research Service, Washington, D.C.

ELECTROSLAG REMELTING OF HEAT-RESISTANT STAINLESS STEELS

V. V. Topilin, M. M. Klyuyev, Ye. V. Voynovskiy, V. M. Doronin, and D. P. Rozanov *In its* Steel Production by Electroslag Remelting 19 Nov. 1963 p 6–18 refs Transl. into ENGLISH from Stal' (Moscow), no. 9, Sep. 1963 p 805–809 (See N64-10847 02-18) OTS: $0.50

Electroslag remelting of heat-resistant low-nickel steels, EI-361, EP-65, using slag ANF-6 at an optimum current density of 0.18-0.25 amp/mm^2, makes it possible to produce good quality metal; plates produced from such metal have a dense structure, without flaws. Author

N64-10864 Armour Research Foundation, Chicago, Ill.

DEVELOPMENT AND APPLICATION OF A THEORY FOR PLASTIC DEFORMATION OF CEMENTED ALLOYS. TASK 3: ROCKET NOZZLE MATERIALS Quarterly Report, 1 Jan.–31 Mar. 1963

N. M. Parikh 30 Apr. 1963 19 p
(Contract DA-11-022-505-ORD-3092)
(WAL-TR-372/32-8, T3; AD-416446)

This report describes the experiments related to process development for fabrication of tungsten-silver rocket nozzle materials. The simple techniques of plating tungsten powders, sintering, and infiltrating with silver, yields materials with properties and microstructures identical to the commercial materials. A simpler one-step process involving liquid-phase sintering of cold-pressed powders also yields a similar product. Author

N64-10951* Honeywell Research Center, Hopkins, Minn.

LOW-TEMPERATURE TOTAL EMITTANCE CALORIMETER

R. N. Schmidt and J. E. Janssen *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 225–230 refs (See N64-10937 02-01) GPO: $3.50

Apparatus consisting of an evacuated chamber, liquid nitrogen-cooled thermopile, and sample heater, for measuring total hemispherical emittance in the range −100° to +200° F is described. The thermopile is calibrated with the aid of a blackbody, and the emittance of a specimen is computed from the heat balance at the thermopile surface. Hemispherical values are obtained by locating the sample close to the thermopile so that the sample is viewed through a solid angle of nearly 2π steradians. A theoretical error analysis indicates a maximum uncertainty of ±3.25%, but comparative measurements indicate an experimental error of only ±2%. Author

N64-11008 Joint Publications Research Service, Washington, D.C.

SINTERING CHROMIUM BORIDE

P. S. Kislyy and V. S. Neshpor *In its* Soviet Res. in Powder Metal Mater. 28 Feb. 1963 p 1–4 refs (See N64-11007 02-01)

Chromium boride is usually obtained in the form of a powder during the reduction of chromium oxide by boride carbide in a vacuum, or by direct synthesis from components in the hard state. A discussion is presented of the technological conditions for converting chromium boride powder into the compact state by methods of powder metallurgy. R.T.K.

N64-11010 Joint Publications Research Service, Washington, D.C.

METHODS OF PREPARING ALLOYS OF TITANIUM CARBIDE WITH MOLYBDENUM

V. N. Eremenko and T. Ya. Velikanova *In its* Soviet Res. in Powder Metal Mater. 28 Feb. 1963 p 10–13 refs (See N64-11007 02-01)

The experiments conducted show that alloys of titanium carbide with molybdenum can be obtained by sintering in a vacuum, with high temperatures, or by heat pressing. Results indicate that for preparation of clean alloys, without impurities, the vacuum sintering method is best. R.T.K.

N64-11015 Joint Publications Research Service, Washington, D.C.

PROPERTIES OF TUNGSTEN-RHENIUM ALLOYS

Ye. M. Savitskiy, M. A. Tylkina, S. I. Ipatova, and Ye. I. Pavlova *In its* Soviet Expt. with Tungsten, Molybdenum and Alloys of Refractory Metals 5 Mar. 1963 p 1-12 refs Transl. into ENGLISH of an article from Metalloved. i Term. Obrabotaka Metal. (Moscow), no. 9, 1960 p 20–25 (See N64-11014 02-01) OTS: $1.50

The properties of tungsten–rhenium alloys were studied in order to compare them with those of tungsten, and to construct a tungsten–rhenium phase diagram. The study included the effect of rhenium on recrystallization of tungsten, the effect of annealing on mechanical properties of wire specimen at room temperature, the tensile properties of tungsten–rhenium alloys at various temperatures, and the electrical resistivity of tungsten–rhenium alloy wire. The tungsten–rhenium phase diagram was completed, and the results of the study showed that the alloying of tungsten with rhenium demonstrated an improvement over tungsten in the case of the specific properties investigated. C.L.W.

N64-11016 Joint Publications Research Service, Washington, D.C.

THE INFLUENCE OF CERTAIN OXIDES UPON THE RECRYSTALLIZATION OF MOLYBDENUM

D. A. Prokoshkin and Shao-Tszyun *In its* Soviet Expt. with Tungsten, Molybdenum and Alloys of Refractory Metals 5 Mar. 1963 p 13-18 refs Transl. into ENGLISH of an article from Metalloved. i Term. Obrabotak Metal. (Moscow), no. 3, 1961 p 9–11 (See N64-11014 02-01) OTS: $1.50

The influence of titanium oxide, zirconium oxide, thorium oxide, and a complex addition agent containing titanium and zirconium oxide on the recrystallization of molybdenum, is discussed. To study the recrystallization, specimens of all alloys were held in a salt bath at various temperatures for 30 minutes. Microhardness, microstructure, and X-ray methods were used for the investigation. The relation of the microhardness of molybdenum and its alloys to the annealing temperature is shown. Among three molybdenum alloys with zirconium oxide additions, the one with the most desirable properties was shown to be the alloy with 0.5% zirconium oxide. The influence of titanium oxide on the microhardness of molybdenum was shown, and an alloy with an addition of 0.1% titanium oxide has the highest recrystallization temperature. Thorium oxide was found to be less effective in increasing the recrystallization temperature of molybdenum. C.L.W.

N64-11017 Joint Publications Research Service, Washington, D.C.

EXPERIMENTAL DETERMINATION OF THE ENTHALPY OF MOLYBDENUM AT TEMPERATURES OF 700-2337 DEGREES

V. A. Kirillin, A. Ye. Sheyndlin, and V. Ya. Chekhovskoy *In its* Soviet Expt. with Tungsten, Molybdenum and Alloys of Refractory Metals 5 Mar. 1963 p 21-27 refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 139, no. 3 1961 p 645-647 (See N64-11014 02-01) OTS: $1.50

The enthalpy of molybdenum was determined on experimental equipment which operates on the mixing method. The operation of the equipment is described, and the techniques and procedures utilized in the measuring are discussed. The results of the measuring are given in table form. C.L.W.

N64-11018 Joint Publications Research Service, Washington, D.C.

INVESTIGATION OF THE EFFECT OF TEMPERATURE ON THE MIGRATION OF ELEMENTS IN ALLOYS OF REFRACTORY METALS

M. D. Smolin and I. N. Frantsevich *In its* Soviet Expt. with Tungsten, Molybdenum and Alloys of Refractory Metals 5 Mar. 1963 p 28–33 refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 136, no. 1, 1961 p 81–83 (See N64-11014 02-01) OTS: $1.50

The migration of both components of tungsten–molybdenum alloys was investigated within a wide range of temperatures. Experiments on migration were made with wire samples 0.5 mm in diameter and about 60-mm long, prepared by sintering. In all experiments, under the effect of a constant electric field, migration of molybdenum ions was observed towards the anode and the migration of tungsten ions towards the cathode. C.L.W.

N64-11020 Joint Publications Research Service, Washington, D.C.

THE USE OF TUNGSTEN IN POWDER IN THE PRODUCTION OF A POWDER WIRE FOR AUTOMATIC BUILD-UP

N. A. Mal'tsev *In its* Soviet Expt. with Tungsten, Molybdenum and Alloys of Refractory Metals 5 Mar. 1963 p 42-44 Transl. into ENGLISH of an article from Avtomat. Svarka (Kiev), no. 6, 1961 p 56-57 (See N64-11014 02-01) OTS: $1.50

Research was conducted to obtain a reliable and convenient method of alloying a molten metal using a powder wire. Ferro-chrome, ferro-tungsten, ferro-manganese, ferro-vanadium, and ferro-titanium were used as the charge material to fill the core of the powder wire. The ferro-alloys, with the exception of ferro-tungsten, did not cause any difficulty in the processes of grinding and crushing. It was decided to replace the ferro-tungsten alloy with tungsten powder. This substitution made it considerably easier to correct the chemical composition of the charge. The wire made using tungsten powder was tested in rebuilding worn press parts, and the results of the tests were positive. C.L.W.

N64-11021 Joint Publications Research Service, Washington, D.C.

LOW-TEMPERATURE SINTERING OF MOLYBDENUM

A. V. Savin and Yu. A. Eyduk *In its* Soviet Expt. with Tungsten, Molybdenum and Alloys of Refractory Metals 5 Mar. 1963 p 45–54 refs Transl. into ENGLISH of an article from Tsvetn. Metal., (Moscow), no. 5, 1959 p 81–84 (See N64-11014 02-01) OTS: $1.50

Investigations were conducted on the sintering of compact molybdenum powder in a temperature range of 1400° to 1700°, with varying humidity in a hydrogen atmosphere. The molybdenum powder was obtained by hydrogen reduction at different temperatures. Molybdenum powder reduced at about 870° displayed the maximum capacity for compaction, whereas the lowest capacity to recrystallization growth of grains during a thermochemical treatment was displayed by molybdenum obtained from powders reduced at 1300° to 1500°. Molybdenum moldings from initial powders of various grain sizes, obtained in low temperature sintering, were made into wires with diameters of 2, 0.9, and 0.5 mm. The wire made from coarse-grained powder displayed the highest mechanical properties. C.L.W.

N64-11062 Joint Publications Research Service, Washington, D.C.

PROBLEMS AND ACHIEVEMENTS IN SOVIET SCIENCE

A. A. Blagonravov et al 30 Apr. 1963 25 p Transl. into ENGLISH of two articles from Vestnik Akad. Nauk SSSR (Moscow), no. 1, 1963 p 3–10 and 45–50
(JPRS-19020; OTS-63-21738) OTS: $0.75

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1. PROBLEMS AND ACHIEVEMENTS IN SOVIET SCIENCE A. A. Blagonravov p 1–13
2. THE INDUSTRIAL APPLICATION OF SCIENTIFIC ACHIEVEMENTS G. S. Pisarenko p 14–23

N64-11092 National Lead Company of Ohio, Cincinnati

BETA HEAT TREATING OF URANIUM USING A ROLLING QUENCH MACHINE

J. F. Mac Neill, B. W. Schoolfield, T. D. Nixon, and D. W. Drott
(Contract AT (30-1)-1156)
(NLCO-891) OTS: $0.50

Uranium fuel core blanks were heated in molten salt and quenched in a Gleason rolling-quench machine. Both oil and water were evaluated as quenching media. The warpage of the pieces was held to very low values. Metallographic examination of the pieces showed that fine grain structures were produced with both quenching media. The structure of the oil-quenched pieces were uniform and were within reactor specifications; however, the pieces quenched in water exhibited a variation in structure in areas where mechanical pressure had been applied. Author

N64-11100* Douglas Aircraft Co., Inc., Santa Monica, Calif.
EVALUATION OF MARAGING STEEL FOR APPLICATION TO SPACE LAUNCH VEHICLES Progress Report 1
Z. P. Saperstein and W. V. Mixon 8 Jul 1963 55 p refs
(NASA Contract NAS7-214)
(NASA CR-52673; SM-43105) OTS: $5.60 ph, $1.85 mf
$1.85 mf

Plate from a new heat of airmelted 18Ni-7Co-5Mo maraging steel has been evaluated, and the results are compared to those obtained on a previously evaluated heat. Hardness, uniaxial tensile properties, and toughness were determined after selected aging treatments. The properties obtained on the new heat of material coincide reasonably well with those of the previously evaluated heat, although some differences do exist. Metallographic examination revealed the presence of inclusions and banding which may have a significant influence on properties. Author

N64-11144 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
PROBLEMS IN METALLURGY AND PHYSICS OF METALS
V. A. Il'ina et al 12 Dec. 1962 163 p refs Transl. into ENGLISH of selected papers from Probl. Metalloved. i Fiz. Metal., 7th Sb. Trudov (Moscow), 1962 p 34–92, 156–174, 231–245, and 281–306
(FTD-TT-62-1290/1+2+4; AD-294517)

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1. THE NATURE OF CHANGES IN THE MODULUS OF ELASTICITY AND IN CHARACTERISTIC TEMPERATURE DURING HEAT TREATMENT OF SOLID SOLUTIONS ON A NICKEL BASE V. A. Il'ina, V. K. Kritskaya, G. V. Kurdyumov, and Yu. A. Osip'yan p 1–39 refs (See N64-11145 02-18)
2. BRITTLENESS IN STEEL IN LOW-TEMPERATURE TEMPERING V. I. Sarrak and R. I. Entin p 40–80 refs (See N64-11146 02-18)
3. AN ELECTRON MICROSCOPE FRACTOGRAPHIC STUDY OF THE MICROMECHANISM OF THE FAILURE PROCESS IN STEEL AND IRON L. G. Orlov and L. M. Utevskiy p 81–105 refs (See N64-11147 02-18)
4. INVESTIGATING AUSTENITIC TRANSFORMATION IN THE MIDDLE REGION DIRECTLY AT THE TRANSFORMATION TEMPERATURES L. I. Kogan and R. I. Entin p 106–127 refs (See N64-11148 02-18)
5. SOME FEATURES OF REVERSE MARTENSITIC TRANSFORMATION Ya. M. Golovchiner p 128–159 refs (See N64-11149 02-18)

N64-11145 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THE NATURE OF CHANGES IN THE MODULUS OF ELASTICITY AND IN CHARACTERISTIC TEMPERATURE DURING HEAT TREATMENT OF SOLID SOLUTIONS ON A NICKEL BASE
V. A. Il'ina, V. K. Kritskaya, G. V. Kurdyumov, and Yu. A. Osip'yan *In its* Problems in Met. and Phys. of Metals 12 Dec. 1962 p 1–39 refs (See N64-11144 02-18)

The effects on heat treatment, expressed in the varying dependence of the modulus of elasticity in ferromagnetic solid solutions on a nickel base, are described. A 99.97% pure electrolyte of nickel and solid solutions of aluminum, copper, cobalt, chromium, iron, and molybdenum in this material were used in varying alloying compositions. Young's Modulus for the alloys was determined after heat treatment and machining in order to determine the effect on the alloys' characteristics of cold plastic deformation, heat treatment and prequenching, heat treatment and annealing, and heat of formation. The microstructure, electrical resistance, the modulus of rigidity and internal friction, and the temperature dependence of the Young's Modulus were also studied. It is concluded that thermal treatment of such alloys greatly changes most of their physical and engineering properties, except that of their dispersion of X-rays. D.E.R.

N64-11146 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
BRITTLENESS IN STEEL IN LOW-TEMPERATURE TEMPERING
V. I. Sarrak and R. I. Entin *In its* Problems in Met. and Phys. of Metals 12 Dec. 1962 p 40–80 refs (See N64-11144 02-18)

The processes causing brittleness in low-temperature tempered steels have been studied in order to give a basis for eliminating such processes. The processes are divided into two types—those of martensitic decomposition and residual austenite formation, and those occurring before phase transition and leading to changes in plastic properties of the steel. It is found that raising the threshold of cold brittleness in steel after quenching is explained by the formation of elastically distorted regions as a result of martensite transformation. These regions act as stress concentrators on loading and serve as nuclei of fracture cracks. It is also noted that a further rise in the tempering temperature leads to the development of an irreversible temper brittleness. The development of irreversible temper brittleness in steels with a boron additive, or after thermochemical treatment and vacuum remelting, is not accompanied by the appearance of failure along austenitic grain boundaries, as is the case with ordinarily treated steels. D.E.R.

N64-11147 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
AN ELECTRON MICROSCOPE FRACTOGRAPHIC STUDY OF THE MICROMECHANISM OF THE FAILURE PROCESS IN STEEL AND IRON
L. G. Orlov and L. M. Utevskiy *In its* Problems in Met. and Phys. of Metals 12 Dec. 1962 p 81–105 refs (See N64-11144 02-18)

Electron microphotography has been used to study the failure process in steels. The results obtained define the microstructure of the transcrystalline spalls associated with brittle fracture, the intergranular fractures occurring in tempered brittle rupture, and the relief of ductile fractures. D.E.R.

N64-11148 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
INVESTIGATING AUSTENITIC TRANSFORMATION IN THE MIDDLE REGION DIRECTLY AT THE TRANSFORMATION TEMPERATURES
L. I. Kogan and R. I. Entin *In its* Problems in Met. and Phys. of Metals 12 Dec. 1962 p 106–127 refs (See N64-11144 02-18)

It has been shown that austenitic transformation in the middle region occurs by means of diffusion redistribution of carbon in the austenite and in the martensitic gamma to alpha transition. X-ray investigation has further proven the mechanisms of bainitic transformation at temperatures of austenitic transition in the middle region. The change in the crystal edge of the residual austenite is shown to be caused by the redistribution of carbon. The same carbon diffusion redistribution processes in the austenite cause austenitic inhomogeneities, expressed by the fading of the austenitic interference lines and the growth of alpha-phase crystals during intermediate transformation. It may be concluded that a rise in the transformation temperatures of austenite in the middle region lowers the carbon concentration in the alpha-phase which is in the formation process. The temperature range for the intermediate transformation in carbon steel has been determined with the upper boundary being 530° to 540°, and with a certain amount of this transformation occuring from 470° to 530°, after pearlitic transformation. D.E.R.

N64-11149 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

SOME FEATURES OF REVERSE MARTENSITIC TRANSFORMATION

Ya. M. Golovchiner *In its* Problems in Met. and Phys. of Metals 12 Dec. 1962 p 128–159 refs (See N64-11144 02-18)

It has been found that reverse martensitic transformation is not obligatory for those metals and alloys in which direct transformation is observed. Feasibility is determined by the location of the point T_0 for the given equilibrium or quasi-equilibrium diffusionless transformation, and by the mobility of the atoms in the elements of the alloy. There may be conditions in which reverse martensitic transformation is impossible, though the metal or alloy is observed to undergo direct martensitic transformation; the criteria of the two phenomena do not coincide. Two types of nucleation are possible in reverse martensitic transformation: dependent, with the appearance of clear relief and little phase strain hardening, and independent, with no relief and great phase strain hardening, characteristic of Fe–Ni and Fe–Mn alloys, respectively. Two conditions are required for direct martensitic transformation—occurence without diffusion and occurence by the reconstruction of the crystal lattice with an elastic ordering of the atomic arrangement on the phase border. D.E.R.

N64-11171 Universite Libre de Bruxelles, Brussels (Belgium)

VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURES. PART XII. MASS SPECTROMETRIC DETERMINATION OF THE DISSOCIATION ENERGIES OF GASEOUS InS, In_2S and In_2S_2 Technical Documentary Report [July 1962–July 1963]

R. Colin and J. Drowart Wright-Patterson AFB, Ohio, AF Mater. Lab., Sep. 1963 28 p refs
(WADD-TR-60-782, Pt. XII; AD-422039)

Investigation of the saturated vapor above InS, In_2S_3, and In_2S_3 + In samples of the superheated vapor has yielded: $In_2S(g)—2In(g) + 1/2S_2(g)$, $\Delta H^\circ_{298} = 98.2 \pm 5.0$ kcal/mole; $In_2S_2(g)—In_2S(g) + 1/2S_2(g)$, $\Delta H^\circ_{298} = 26.5 \pm 6.0$ kcal/mole; $InS(g)—In(g) + 1/2S_2(g)$, $\Delta H^\circ_{298} = 17.4 \pm 4.0$ kcal/mole. Combining these data with $D^\circ_{298}(S_2) = 102.0 \pm 2.0$ kcal/mole one obtains: $\Delta H^\circ_{298}(at.In_2S) = 149.2 \pm 5.5$; $D^\circ_{298}(InS) = 68.4 \pm 4.5$; $\Delta H^\circ_{298}(at.In_2S_2) = 226.7 \pm 8.0$; $D^\circ_{298}(dim,InS) = 89.9 \pm 11.0$ kcal/mole. Author

N64-11172 Universite Libre de Bruxelles, Brussels, Belgium

VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURES. PART XIII. MASS SPECTROMETRIC STUDY OF THE SYSTEMS BORON-CARBON AND BORON-CARBON-SILICON Technical Documentary Report [July 1962-July 1963]

G. VeRhaegen, F. E. Stafford, and J. Drowart Wright-Patterson AFB, Ohio, AF Mater. Lab., Sep. 1963 28 p
(Contract AF 61(052)-225)
(WADD-TR-60-782, Pt. XIII; AD-421950)

The systems B-C and B-C-Si were investigated by the mass spectrometer method. The atomization energy of the newly identified molecules BC_2, B_2C, BCSi, BSi_2, BC, and BSi are 294, 254, 247, 174, 107, and 68 kcal/mole, respectively. The atomization energy of SiC_2, Si_2C, and SiC were redetermined. Author

N64-11210 Joint Publications Research Service, Washington, D.C.

MECHANICAL PROPERTIES OF COPPER-NICKEL ALLOYS AT ELEVATED TEMPERATURES

B. Ya. Pines and I. G. Ivanov 19 Feb. 1963 14 p refs Transl. into ENGLISH of an article from Fiz. Tverd. Tela (Moscow), v. 4, no. 8, Aug. 1962 p 2109–2115
(JPRS-17728; OTS-63-21173) OTS: $0.50

A study was made of the variation of the minimum creep rate, V, and the life under load, τ, as a function of the concentration (composition) and temperature for copper–nickel alloys, at temperatures of 700° to 1150° C, under stresses of 400 and 1100 g/mm^2. The study indicated that the variations of V and τ are basically conditioned by the variation of the autodiffusion coefficient, D, with concentration. The magnitudes of log V/D and log τD vary little with concentration. The magnitude of log Vτ to a first approximation remains constant with changes in temperature, applied stress, and alloy concentration. The magnitudes of V and τ for alloys of all concentration vary identically with the magnitude of the applied stress. P.V.E.

N64-11215 Joint Publications Research Service, Washington, D.C.

METALLURGICAL REPORTS FROM ZAVODSKAYA LABORATORIYA (PLANT LABORATORY) [MOSCOW] VOL. 29, NO. 2, 1963

G. V. Indenbaum et al 24 Apr. 1963 23 p refs Transl. into ENGLISH of three articles from Zavodsk. Lab. (Moscow), v. 29, no. 2, 1963 p 189-193; 219-221
(JPRS-18889; OTS-63-21668) OTS: $0.75

The following articles are included: (1) Cutting Single Crystals of Aluminum Without Deformation, (2) Experience in Revealing Dislocations in Deformed Metals, and (3) Strength of a Metal-to-Ceramic Bond. R.T.K.

N64-11228* Midwest Research Inst. Kansas City, Mo.

THE EMISSION OF EXO-ELECTRONS FROM ALUMINUM DURING FATIGUE Final Report 1 Sep. 1961–30 Sep. 1963

J. C. Grosskreutz and David K. Benson [1963] 36 p refs
(NASA Contract NASr-63(02); MRI Proj. 2553-P)
(NASA CR-52683) OTS: $3.60 ph, $1.28 mf

Autoradiographic experiments indicated that the exoelectrons originate in slip bands and in freshly exposed crack surface. Exoelectrons emitted during fatigue stressing at 2 × 10^{-5} torr were detected directly with an electron multiplier. The intensity is very low, being only a few percent above the background current of the detector. To investigate further the effects of environmental gases on exoelectron emission, experiments were performed in tension at 10^{-9} and 10^{-6} torr, again using electron multiplier detection. Sensitivity problems prevented the primary objectives, but an upper limit to the emission rate was established to be ~ 100 electrons/cm^2 sec at 10^{-6} torr. This value agrees with earlier work on evaporated aluminum if one assumes that emission occurs only at slip bands. The evidence thus favors the view that exoelectrons are emitted from freshly exposed surface during deformation and that the process of oxidation is necessary for prompt emission. Author

N64-11245* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE RELATIVE SUSCEPTIBILITY OF FOUR COMMERCIAL TITANIUM ALLOYS TO SALT STRESS CORROSION AT 550°F
David N. Braski and George J. Heimerl Washington, NASA, Dec. 1963 25 p
(NASA TN D-2011) OTS: $0.75

The relative susceptibility of four titanium-alloy sheet materials to salt stress corrosion at 500°F has been determined from room-temperature compression tests of a new type of self-stressed specimen, and from crack penetration measurements. Based on the accelerated test conditions, Ti–8A1–1Mo–1V was found to be most susceptible followed by Ti–6A1–4V, Ti–13V–11Cr–3A1, and Ti–4A1–3Mo–1V. No stress corrosion was observed in the Ti–4A1–3Mo–1V. Author

N64-11263 European Atomic Energy Community, Brussels (Belgium)
A STUDY OF CHROMIUM AS A METALLIC BONDING DIFFUSION BARRIER BETWEEN URANIUM AND ALUMINUM [ETUDE DE CHROME COMME LIAISON METALLIQUE ANTIDIFFUSANTE ENTRE URANIUM ET ALUMINUM]
M. Foure, H. Monti (Compagnie Pour L'etude et la Realisation de Combustibles Atomiques, Paris) R. Theisen Paris, CERCA, Sept. 1963 77 p refs In FRENCH; ENGLISH abstract
(EUR 413.f) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 100 Belg. Fr.

The electroplating of chromium on uranium has been investigated and a simple process was developed giving sound and adherent electrolytic depositions. The interdiffusion of uranium and chromium was investigated both between bulk samples of the two pure metals or their alloys and on electrolytic depositions. It was studied on small-scale chromium-plated uranium elements with A5-type aluminum cladding and heat treated under various conditions of time, temperature, and pressure. The composition of the various zones of diffusion was determined by means of an electron microprobe, specially in the case of the total consumption of the chromium barrier where a ternary diffusion U-Cr-Al occurs. Several tests of thermal cycling were run on small-scale fuel elements in an attempt to prove the behavior of the electrolytic deposition of chromium, and the resistance of the bonding between the core and the cladding. Author

N64-11264 Joint Publications Research Service, Washington, D.C.
SOVIET CONFERENCES ON METALLURGY
29 Oct. 1963 39 p Transl. into ENGLISH
(JPRS-21636; OTS-63-41026) OTS: $1.00

CONTENTS: 0 refs

1. INTERNATIONAL CONFERENCE ON STATISTICAL METHODS OF ANALYSIS, MONITORING, AND CONTROL OF METALLURGICAL PROCESSES N. S. Raybman p 1–4
2. CONFERENCE ON DREDGE CONSTRUCTION I. F Baryshnikov p 5–9
3. PREPARATION AND ELECTROCHEMICAL PROCESSING OF CHLORIDE SOLUTIONS OF THE HEAVY METALS A. F. Nikiforov p 10–11
4. SECOND SEMINAR OF THE DEPARTMENT OF TECHNICAL SCIENCES OF THE ACADEMY OF SCIENCES UKRAINIAN SSR p 12–15
5. THIRD INTER-OBLAST SCIENTIFIC AND ENGINEERING CONFERENCE IN PENZA I. V. Dovbishchenko p 16–17
6. MEETING ON AUTOMATIC CONTROL OF WELDING PROCESSES N. V. Podola p 18–20
7. CONFERENCE ON "NEW TRENDS IN THE STUDY AND APPLICATION OF THE RARE-EARTH METALS" V. T. Terekhova p 21–24
8. SIXTH ALL-UNION CONFERENCE ON POWDER METALLURGY V. S. Rakovskiy p 25–26
9. THIRD ALL-UNION SCIENTIFIC CONFERENCE ON RELAXATION PHENOMENA IN METALS AND ALLOYS I. L. Mirkin and A. A. Yudin p 27–30
10. REPUBLIC-WIDE CONFERENCE IN MINSK ON THE APPLICATION OF THE RARE METALS Ye. A. Ul'hanin p 31–35

N64-11267 Joint Publications Research Service, Washington, D.C.
BRAZING
F. V. Kulikov and I. R. Lekhtsiyer 25 Nov. 1963 9 p Transl. into ENGLISH of one sect. and the table of contents from a book "Tverdaya Payka", Moscow, State Power Press, 1959 p 33–39
(JPRS-22033; OTS-63-41233) OTS: $0.50

A discussion is presented of the problems encountered in brazing high-strength steel alloys. Data on the following high-temperature and corrosion-resistant braze types are given: (1) silver-copper-lithium, (2) silver-palladium, (3) manganese-nickel, (4) nickel-chromium-boron-silicon, and (5) nickel-boron-silicon. R.T.K.

N64-11271 Joint Publications Research Service, Washington, D.C.
CERTAIN PROBLEMS INVOLVED IN THE BRAZING OF TITANIUM ALLOYS
A. Ya. Shinyayev and V. V. Bondarev 2 Dec. 1963 12 p refs Transl. into ENGLISH of an article from Svarochnoye Proilzvodstvo (Moscow), no. 10, Oct. 1963 p 15–17
(JPRS-22096; OTS-63-41266) OTS: $0.50

The formation of the diffusion zone between titanium (or its alloys) and various galvanic coatings during brazing with cupric–silver solders was investigated. Results indicate that the maximal strength of a brazed joint of titanium alloys can be obtained under temperature conditions that correspond to the creation of a diffusion zone, in the form of a solid solution, with a finely dispersed segregation of the foci of the second phase with a value not in excess of 3000A. The diffusion zone structure is fixed by the rate of the mutual diffusion between the Ti and the electroplating; this rate is the determining factor in the selection of the type of electroplating for a given range of brazing temperatures. R.T.K.

N64-11276 Joint Publications Research Service, Washington, D.C.
INVESTMENT CASTING
Ya. I. Shklennik et al 6 Dec. 1963 36 p Transl. into ENGLISH of five sections and the table of contents of a book "Lit'ye po vyplavlyayemym modelyam", Leningrad, State Sci. Tech. Publ. House for Maching-Bldg. Lit., 1961 p 328–343; 453–455
(JPRS-22175; OTS-63-41309)

The following topics are discussed: (1) melting high temperature alloys in vacuum furnaces, (2) special features in melting alloys for permanent magnets, (3) melting grade E electric furnace steel, (4) melting titanium in vacuum furnaces, and (5) melting aluminum alloys in electric furnaces. R.T.K.

N64-11287 Nuclear Metals, Inc., Concord, Mass.

FUNDAMENTAL AND APPLIED RESEARCH AND DEVELOPMENT IN METALLURGY: HIGH-TEMPERATURE PROPERTIES OF REFRACTORY ALLOYS Final Report, 1 Jul. 1962-30 Jun. 1963

A. L. Geary 17 Sep. 1963 69 p
(Contract AT(30-1)-2784)
(NMI-1258) OTS: $1.75

Ta–Re–W and Ta–Ru–W ternary alloy compositions, which were selected on the basis of the hot-hardness test results, were arc-cast into 2-in.-diam. ingots and extruded. In the extruded condition, these alloys have ultimate strengths at 1600° C which are two to three times those of commercial tantalum-base alloys. Ta–2 a/o Ru, Nb–2a/o Re, and Nb–5 a/o Re alloys, which were initially investigated in the first year's program, were successfully rolled into strip and tested at temperatures up to 1600° C. Cold-rolling, if followed by a recrystallization anneal, does not influence the properties of Ta–2a/o Ru. The Nb–Re alloys rolled at 1000° C exhibit improved high-temperature strengths as well as improved room-temperature ductility. Author

N64-11288 Atomic Energy Commission, Washington, D.C. Div. of Technical Information

LIQUID METAL TECHNOLOGY. A LITERATURE SEARCH [1 Jan. 1957-30 Jun. 1963]

James M. Jacobs, comp. Aug. 1963 145 p refs
(TID-3544 (Rev. I)) OTS: $2.50

A total of 1682 citations is presented. References are collected under the following subject groupings: general, alkali metals, bismuth, bismuth alloys, bismuth–lead alloys, cesium, lead, lead alloys, lithium, mercury, mercury alloys, NaK, potassium reactor fuel alloys, rubidium, and sodium. Author

N64-11330* Aerojet-General Corp., Downey, Calif. Ordnance Div.

METALLURGICAL EFFECTS OF EXPLOSIVE STRAIN RATES ON METAL ALLOYS Annual Summary Report, 27 Jun. 1961-26 Jul. 1962

J. F. Wilkin, E. K. Henriksen, I. Liberman, and C. A. Landusky 26 Jul. 1962 286 p refs
(NASA Contract NAS8-2416)
(NASA CR-52875; Rept. No. 0513-01(01)FP) OTS: $18.00 ph, $8.78 mf

The following materials were subjected to study: 5456-0 aluminum, AISI 301 stainless steel, 17-7PH stainless steel, and the two titanium alloys, 6Al-4V and 13V–11Cr–3Al. Both uniaxial and biaxial loading conditions were explored, with some materials tested under both ambient and cryogenic (−320° F) temperatures. From the results obtained, it is concluded that: (1) The mechanical properties of a metal are sensitive to the magnitude of the applied strain and to the rate and temperature at which the strain is applied. (2) Changes in metallurgical structure resulting from explosive straining are not prominent, and differences in structural change due to the strain rates within the range investigated are apparently submicroscopic. Author

N64-11348 Joint Publications Research Service, Washington, D.C.

POWDER METALLURGY OF THORIUM, USSR

A. N. Zelikman 26 Apr. 1963 Transl. into ENGLISH of an article in the book "Toriya i Urana" Moscow, 1961 p 218–221
(JPRS-18920; OTS-63-21690) OTS: $0.50

Powder metallurgy of thorium is reviewed. Electrolytic powders of thorium possess high plasticity and permit high pressing pressures; however, the calcium-thermal powders are distinguished by poorer pressibility than the electrolytic powders. Thus, to obtain a cylindrical sample, with a density of 10.5 to 11.0 g/cm^3 from a calcium-thermal powder, a pressing pressure of from 8 to 10 tons/cm^2 is needed; for electrolytic powder only 6 to 8 tons/cm^2 is required. To increase the density of sintered calcium-thermal samples and to improve their mechanical properties, the samples can be supplementarily pressed in the cold (the so-called calibration pressing), followed by annealing under vacuum at a temperature of 1100° C. I.v.L.

N64-11360 Joint Publications Research Service, Washington, D.C.

ELECTROSLAG REMELTING OF A HEAT-RESISTANT STAINLESS STEEL, USSR

G. A. Khazin, R. I. Kolyasnikova, G. A. Vachugov, V. A. Boyarshinov, O. T. Gavrilov et al 5 Dec. 1963 10 p Transl. into ENGLISH of an article from Stal' (Moscow), no. 10, Oct. 1963 p 908–910
(JPRS-22149; OTS-63-41300) OTS: $0.50

The electroslag remelting of steel 13Kh14NVFRA permits a considerable improvement in the macrostructure of the metal, a reduction of its contamination by nonmetallic inclusions, and a reduction of the rejection of serviceable articles. Author

N64-11362 Joint Publications Research Service, Washington, D.C.

SINTERED ALUMINUM POWDER. A COLLECTION OF SOVIET WORKS

A. I. Paisov et al 11 Dec. 1963 53 p refs Transl. into ENGLISH of 8 articles from publ. "Novyye Tekhnologicheskiye Protsessy pri Obrabotke Metallov Davleniyem, Trudy Instituta 57", (USSR), Oborongiz, 1963 p 95–139
(JPRS-22219; OTS-63-41333) OTS: $1.50

The following articles are included: (1) Electron-Microscope Method of Investigating SAP (sintered aluminum powder), (2) Cladding SAP, (3) Methods of Increasing the Weight of Blanks for Rolling SAP, (4) Strength of Clad SAP Sheet, (5) Comparative Evaluation of the Weldability of Clad and Nonclad SAP by Resistance Welding Methods, (6) Technology for Spot and Roller Welding of Clad SAP, (7) Structural Changes During Heating of SAP, and (8) the Problem of the Character of the Distribution of the Oxide Phase in SAP. R.T.K.

N64-11371 Thompson Ramo Wooldridge, Inc., Cleveland, Ohio

INVESTIGATION OF WELDABILITY OF ADDITIONAL COLUMBIUM ALLOYS [1 Jul. 1962-30 Jun. 1963]

J. M. Gerken and T. L. Fullerton Wright-Patterson AFB, Ohio AF Mater. Lab. Oct. 1963 150 p refs
(Contract AF 33(657)-9446)
(ASD-TDR-63-843; AD-422025)

The welding characteristics of four columbium alloys, FS-85, B-66, D-36, and Cb-752, in two thicknesses were the subject of this investigation. The effect of tungsten arc or electron beam welding these alloys was to increase the ductile to brittle transition temperature. The increase was greatest for B-66 and Cb-752 and least for D-36 and FS-85. Generally, electron beam welds in a given alloy were more ductile and slightly stronger than tungsten arc welds. Aging tungsten arc welds at 1800° and 2000° F caused an additional increase in transition temperatures. This effect was most pronounced for welds in B-66 and Cb-752. Author

N64-11372 Brussels U. (Belgium)
VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURES. PART XIV: HIGH TEMPERATURE VAPORIZATION STUDIES
J. Drowart Wright-Patterson AFB, Ohio, Materials Lab., Sep. 1963 12 p refs
(Contract AF 61(052)-225
(WADD-TR-60-782; AD 422035)

A brief summary of the mass spectrometric technique used to obtain thermochemical information at high temperatures is given, as well as data for a number of elements, alloys chalcogenides, and carbides. Author

N64-11373 Aluminum Co. of America, New Kensington, Pa. Alcoa Research Labs.
INVESTIGATION TOWARD OBTAINING SIGNIFICANTLY HIGHER MECHANICAL PROPERTIES OF AS-WELDED JOINTS IN HIGH-STRENGTH, HEAT TREATABLE ALUMINUM ALLOYS
F. R. Collins 20 Sep. 1963 68 p
(Contract DA-36-034-ORD-3237A)
(Rept. 2-63-14; AD 418106)

Previously, it was reported that highest strengths in welded aluminum structures without reheat treating were achieved by welding alloys 7075 and 7178 with filler metal X5080, then postweld aging. Strength was greatly influenced by welding technique. To achieve higher properties and greater reliability, particularly in complex structures, improvements in these three general areas were shown to be needed: (1) stronger filler metals of low sensitivity to hot-short cracking, (2) base metal compositions less damaged by partial melting in the weld area, and (3) welding techniques and procedures that reduce damage to the base metal by minimizing the heat affected zones. This report describes investigations in these and related areas. Author

N64-11386 Aeronautical Research Labs., Melbourne (Australia)
AN APPRAISAL OF POSSIBLE SCAVENGER ELEMENTS FOR CHROMIUM AND CHROMIUM ALLOYS
N. E. Ryan Apr. 1963 39 p refs
(ARL/MET 50)

An assessment has been made of the properties of selected scavenger additions either to remove or to stabilize the interstitial impurities which may be present in chromium. The investigation has combined a consideration of the available thermodynamic data with a metallographic examination of cast alloys. Ce, La, Hf, Th, Ti, U, Y, and Zr readily reacted with nitrogen in chromium during melting and casting. Nb and Ta formed complex nitrides with Cr during heat treatment of the cast alloy. Ce, La, Ti, Y, and Zr were found to be strong scavengers for oxygen in Cr. Monocarbides of Nb, Ta, Th, Ti, U, and Zr were produced in Cr–C alloys. Effective scavenging of interstitial impurities in commercial grades of Cr has been achieved with stoichiometric addition of Ce, Ti, Y, and Zr. Author

19 MATERIALS, NONMETALLIC

Includes mechanical and physical properties of nonmetals (e.g., plastics). *For related information see*: 07 Chemistry; 17 Machine Elements and Processes; 18 Materials, Metallic; 33 Stresses and Loads; and 34 Structural Design.

N64-10672 Joint Publications Research Service, Washington, D.C.
K-ABSORPTION SPECTRA OF CHROMIUM IN BORIDES, CARBIDES, NITRIDES AND SOME OTHER COMPOUNDS
S. A. Nemronov and A. Z. Men'shikov (Inst. of Metals Phys. AN SSSR) *In its* Works on Heat-Resisting Materials, USSR 1960 p 44–60 refs (See N64-10669 02-01) OTS: $2.75

The K-absorption spectra and the magnetic susceptibility of chromium in borides, carbides, nitrides, oxides, and chlorides were investigated. Results indicate that: (1) The nature of the interaction of Cr atoms with the metalloid atoms of the first line of Mendeleev's Table (C l,O, N, C, B) continuously changes from ionic covalent to covalent metallic. (2) The different compounds inside one diagram of state cannot pertain to a single type of bonding forces, because in this case, the concentration of a metalloid can play an essential role. This is particularly characteristic for the compounds CrN and Cr_2N, CrB, and CrB_2. (3) A hypothesis on the metallic state of the metalloid atom (such as is correct in the case of the Pd-H system) cannot be extended to all classes of the Haggian phase of intrusion. The typical intrusion phase of CrN is close to Cr_2O_3 by nature of the interatomic interaction, and in this oxide, the bonding forces have ionic covalent character. (4) The character of the bonding forces in metalloid compounds is complex. I.v.L.

N64-10675 Joint Publications Research Service, Washington, D.C.
STRUCTURE AND PROPERTIES OF RARE-EARTH METAL BORIDES
G. V. Samsonov (Moscow State U.) and N. N. Zhuravlev (Inst. of Metal Ceramics and Special Alloys, AN USSR) *In its* Works on Heat-Resisting Materials, USSR 1960 p 95–115 refs (See N64-10669 02-01) OTS: $2.75

The structures and crystallochemical peculiarities of the following rare-earth metal borides are discussed: MeB_2, MeB_4, and MeB_6. Also, the thermionic emission, the magnetic properties, and the electric and thermoelectric properties of metal hexaborides (MeB_6) are discussed. I.v.L.

N64-10676 Joint Publications Research Service, Washington, D.C.
PRECISION DETERMINATION OF THE LATTICE PERIODS OF BORON CARBIDES OF $B_{2.75}$ TO $B_{6.75}$ COMPOSITION BY MEANS OF ROENTGENOGRAMS OBTAINED WITHIN THE RANGE OF LARGE ANGLES OF SCATTERING ($\circ\rightarrow 90^\circ$)
V. I. Kudryavtsev and G. V. Sofronov (All-Union Sci. Res. Inst. of Abrasives and Polishing) *In its* Works on Heat-Resisting Materials, USSR 1960 p 116–144 refs (See N64-10669 02-01) OTS: $2.75

Industrial samples of boron carbide of variable composition from $B_{2.75}C$ to $B_{6.75}C$ were investigated roentgenographically, i.e., by the large-angles method. Results are as follows: (1) Precision determinations were made of the values of the lattice periods of boron carbide in the $B_{2.75}C$-$B_{6.75}C$ interval; (2) A range of continuous solid intrusion solution of B or C were established in $B_{12}C_3$ without change in the lattice periods in the $B_{12}C_5$-$B_{12}C_3$-$B_{14}C_3$ intervals; (3) A range of continuous series of solid replacement of the central C atoms in the linear chain C-C-C was established in $B_{14}C_3$; (4) Boron carbide of the composition $B_{15}C_2$ is formed in the case of full substitution; (5) The value of the boron carbide periods in the $B_{14}C_3$-$B_{15}C_2$ interval does not remain constant but depends upon the B concentration in the solid solution of boron carbide. The larger the B concentration is, the larger are the parameters a and c, and the smaller is the reflection angle theta. I.V.L.

N64-10714 Joint Publications Research Service, Washington, D.C.
DEPENDENCE OF THE STRENGTH OF FRACTURE WHISKERS ON THEIR SIZE
P. G. Strelkov and A. A. Shpunt 19 Feb. 1963 8 p refs Transl. into ENGLISH from Fiz. Tverd. Tela (Leningrad), v. 4, no. 8, Aug. 1962 p 2258–2261

Results are presented of an investigation of the strength of the fracture whiskers of lithium fluoride. Calculations based on the experimental results show that a fracture whisker of cross-sectional dimension of approximately 1 micron cannot contain dislocations and therefore has a strength of the order of the theoretical value. R.T.K.

N64-10728 Joint Publications Research Service, Washington, D.C.
INVESTIGATION OF THE AUTOCLAVE METHOD OF PRODUCING RHENIUM FROM POTASSIUM PERRHENATE
A. N. Zelikman and V. F. Pritulo (Krasnoyarsk Inst. of Nonferrous Metals) *In its* Sov. Exptl. Electrolytic and Autoclave Production of Rhenium Powder 5 Mar. 1963 p 1–20 refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Tsvet. Met (Dzaudzhikau), no. 4, 1961 p 112–120 (See N64-10727 02-18)

The conditions for separating rhenium from solutions of potassium perrhenate were studied at high temperatures and under hydrogen pressure. Under optimum conditions for autoclave reduction, the rhenium powders contained no more than 0.002% to 0.003% of impurities of potassium, sodium, and calcium. Rhenium powders produced by the autoclave method could be converted into compact malleable metal. R.T.K.

N64-10729 Joint Publications Research Service, Washington, D.C.
USE OF VARIABLE POLARITY CURRENT IN THE ELECTROLYTIC PRODUCTION OF RHENIUM POWDER
S. I. Sklyarenko, I. I. Lavrov, and Yu. P. Shamagin (Moscow Inst. of Fine Chem. Technol.) *In its* Sov. Exptl. Electrolytic and Autoclave Production of Rhenium Powder 5 Mar. 1963 p 22–30 refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Tsvet. Met. (Dzaudzhikau), no. 1, 1962 p 111–114 (See N64-10727 02-18)

A current of variable polarity was used to produce a fine rhenium powder suitable for manufacturing a compact metal. The effect of electrolysis on the grain size of the powder and on current efficiency was studied. Results indicate that rhenium powder obtained by using variable polarity current is of finer grain, and has better metalloceramic properties than powder obtained by means of direct current.
R.T.K.

N64-10808 Joint Publications Research Service, Washington, D.C.
BIBLIOGRAPHIC INDEX OF USSR WORKS ON CORROSION AND PROTECTION OF MATERIALS
V. V. Krasnoyarskiy and F. M. Reznik 29 Oct. 1963 132 p refs Transl. into ENGLISH of portions of the book "Korrosiya i zashchita materialov–Bibliografiya otechestvennoy leteratury za period s 1917 po 1959 gody", Moscow, State Sci.-Tech. Publishing House for Machine-building Lit., 1961 p 5–12, 13, 14–16, 60–61, 71–75, 82–87, 147–153, 164–165, 210–213, 232–234, 240–242, 252–259, 263–266, and 268–275 (JPRS-18939; OTS-63-21697) OTS: $2.75

The bibliography is divided into the following: (1) the role of protective films in the corrosion process of metals, (2) soil corrosion, (3) corrosion in aggressive media, (4) corrosion inhibitors (retarders), (5) preservative coatings and lubricants, (6) nonmetallic coatings—general questions, (7) asphalt coatings, (8) plastics in anticorrosion technology, (9) protection of underground installations from corrosion and stray currents, (10) corrosion and protection in the oil-refining industry, and (11) corrosion and nonmetallic materials. P.V.E.

N64-10841 Joint Publications Research Service, Washington, D.C.
DEVELOPMENTS IN CZECHOSLOVAK POWDER METALLURGY
Vladimir Dufek et al 22 Jul. 1963 22 p Transl. into ENGLISH of 2 articles from Technicke Zpravy VUPM (Sumperk), no. 4, 1962 p 2–14 and 21–26
(JPRS-20291; OTS-63-31351) OTS: $0.75

Developments in powder metallurgy are reported. Metal-ceramic friction materials on a bronze base were manufactured under the trade name of Diafrikt. The basic component of these materials is copper which is fused with tin to form a mechanically solid, heat-conducting bronze framework. The plasticity of copper facilitates molding of the powders at relatively low pressures; and the tin can be partially or entirely replaced by zinc. The main ingredient which provides good friction properties is silicon oxide. Graphite and lead are added to provide the required amount of slip. The available types of Diafrikt are listed; the average values for the coefficient of friction and temperature of Diafrikt samples are given; and results of laboratory and operational tests are presented. In addition, a brief review is presented of the production technology of metal-ceramic friction materials and their characteristic properties important for the construction of linings. The preparation of powder mixtures, pressing, sintering, and finishing of products are included. R.T.K.

N64-10862 Electrotechnical Lab., Tokyo (Japan)
A STUDY ON ELECTROCONDUCTIVE GLASSES
Motosuke Munakata Jan. 1963 158 p refs In JAPANESE; ENGLISH synopsis
(*Its* Researches 638)

Relations between conductivities of some electroconductive glasses ($10^3 \sim 10^8 \Omega$cm) and melting conditions, and the conduction mechanism were investigated. The glass-forming range was determined for the silicate, borate, phosphate, telluride, and arsenate systems, each containing V_2O_5, MoO_3, WO_3, Fe_2O_3, Ni_2O_3, TiO_2 or MnO. Phosphate glass was found to be most suitable for dissolving the transition metal oxide in high concentration. Although high vanadium phosphate glass increases its density during the heat treatment process in the transformation range, its conductivity was independent of temperature of the treatment. It was found that the conductivity of this glass was affected by the melting condition, and the existence of a vanadium ion of valence lower than 5 has been proved, the amount sometimes exceeding 40% of the total vanadium content. The low valence vanadium was rationally estimated to be V^{4+}. The resistivity varies with the concentration of V^{4+}, and has a minimum at a certain value of V^{4+}/V_{total}, as far as the concentration of total vanadium is kept constant. The conduction is due to valence electron exchange between V^{4+} and V^{5+} similar to the case of Fe_3O_4. Phosphate glasses of high concentration of iron, Mo, W, and Ti were also investigated. Author

N64-11011 Joint Publications Research Service, Washington, D.C.
PRODUCTION OF TITANIUM NITRIDE FROM SPONGE TITANIUM
T. S. Verkhoglyadova *In its* Soviet Res. in Powder Metal Mater. 28 Feb. 1963 p 14–15 ref (See N64-11007 02-01)

A method has been developed for producing titanium nitride out of nonconditioned sponge titanium. Titanium nitride is obtained by the method of direct nitriding of the waste products of sponge titanium with grain thickness of 2 to 5 millimeters, at a temperature of 1200° C. R.T.K.

N64-11165 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
FUSIBILITY DIAGRAMS IN THE SYSTEMS $LiClO_4$–$Ca(ClO_4)_2$ AND $NaClO_4$– $Ca(ClO_4)_2$
N. V. Krivtsov and A. A. Zinov'yev 15 Aug. 1963 13 p refs
Transl. into ENGLISH from Zhur. Neorg. Khim. (Moscow), v. 8, no. 1, 1963 p 186–191
(FTD-TT-63-565/1+2+4; AD-414157)

The investigation of fusibility in systems composed of anhydrous perchlorates is limited to only a few studies in which the absence of binary compounds is shown. It has been established that the system $NaClO_4$–$Ba(ClO_4)_2$ is characterized by the presence of only a simple eutectic and by two polymorphic transitions of barium perchlorate. The absence of a binary compound was established in the system $NaClO_4$–$LiClO_4$. However, in this case, there was indicated the existence of solid solutions derived from sodium perchlorate. A study of the system $LiClO_4$–$KClO_4$ showed that only a simple eutectic and a polymorphic transition of $KClO_4$ exist. Author

N64-11175 Naval Ordnance Lab., White Oak, Md.
A ONE-DIMENSIONAL NUMERICAL TREATMENT OF THE TRANSITIONAL EVENTS LEADING TO DETONATION FOR DENSE HETEROGENEOUS EXPLOSIVES
F. J. Petrone and Donna Price Dec. 1963 28 p refs
(NOLTR-63-197; AD-422764)

In an attempt to obtain a general numerical one-dimensional treatment of the initiation of cast heterogeneous explosives, it is shown that a complete numerical treatment is intractable. However, by taking a phenomenological approach, a physically reasonable method of bridging the thermal conduction and the hydrodynamic regimes of the transitional phenomena is demonstrated, and, by assuming *a posteriori* the formation of "hot spots," a modified hypothesis of the transitional events is developed. The results which are obtained reproduce the experimental trends qualitatively, and give an insight into the transition mechanism. Author

N64-11218 Joint Publications Research Service, Washington, D.C.
DIELECTRICS
31 May 1963 13 p Transl. into ENGLISH of an article from Radio (Moscow), no. 4, Apr. 1963 p 55–58
(JPRS-19519; OTS-63-21969) OTS: $0.50

The most widely used plastics are those based on phenol-formaldehyde resins, and those plastics based on carbamide resins. The characteristics, e.g., specific gravity, tensile strength, etc., of the most widely used plastics are given. The main characteristics of the most widely used electrical insulation materials (mica, ceramics, glass) are also presented. R.T.K.

N64-11282 Weapons Research Establishment (Australia)
NON-LINEAR STRESS V STRAIN BEHAVIOUR OF TWO TYPES OF CERMET
J. R. Baxter Sep. 1963 27 p refs
(CPD-65)

Measurement of the tensile strain behavior of copper-alumina and silver-alumina cermets, both of which have a continuous ceramic phase, show that the stress vs. strain relation for these materials departs from linear to a marked extent. This nonlinear behavior has been studied by strain measurements on the cermets and on the alumina phase both before the introduction of the metal phase and after removal of the metal from cermet specimens. Explanations are proposed for the stress vs. strain behavior of both types of cermet. Author

N64-11291 General Electric Co., Cincinnati, Ohio Nuclear Materials and Propulsion Operation
HIGH-TEMPERATURE MATERIALS PROGRAM Progress Report No. 28, PART A
11 Nov. 1963 38 p refs
(Contract AT(40-1)-2847)
(GEMP-28A)

Results of research activities in the following areas are presented: (1) radiation effects on BeO, (2) fission gas diffusion in unfueled ceramic materials, (3) internal-conversion ceramic fuel-element research, and (4) fission product transport processes in refractory-metal fuel systems. R.T.K.

N64-11306 Hanford Atomic Products Operation, Richland, Wash.
CERAMICS RESEARCH AND DEVELOPMENT OPERATION Quarterly Report, Apr.-Jun. 1963
H. J. Anderson et al 4 Nov. 1963 104 p refs
(Contract AT(45-1)-1350)
(HW-76302) OTS: $2.25

Progress is reported in: (1) ceramics research, including preparation, vaporization, and sintering studies of various combinations of uranium, plutonium, boron, oxygen, nitrogen, and aluminum; (2) fuels development, including fuel-element rejuvenation and fabrication, pneumatic impaction, and hazards analysis; and (3) fuels testing and analysis, including fuel-element inspection, irradiation, and nondestructive testing. J.E.T.

N64-11326* Narmco Research and Development, San Diego, Calif.
DEVELOPMENT OF ADHESIVES FOR VERY LOW TEMPERATURE APPLICATION Final Summary Report [10 Apr. 1961–10 Apr. 1963]
M. Bruce Smith and Samuel E. Susman 1 May 1963 216 p refs
(NASA Contract NAS8-1565)
(NASA CR-52879) OTS: $14.50 ph, $6.68 mf

Research efforts were concentrated in the areas of nylon-epoxy, epoxy-polyamide, polyurethane, and fluorocarbon film systems. Efforts of fillers, film supporting media, and surface preparation were evaluated. A wide variety of aluminum and stainless alloy adherends were also evaluated. Tensile shear, tee peel, mechanical shock, and butt tensile strengths were determined down to −423° F. Impact, compression loading, and coefficients of expansions were determined down to −320° F. The best six adhesives were (1) a nylon powder filled epoxy-polyamide paste system, (2) a Teflon FEP film epoxy-polyamide composite, (3) and (4) polyurethanes, (5) a glass fabric supported polyurethane, and (6) a Teflon FEP hot-melt adhesive. With the exception of the latter, all adhesives were capable of producing bonds when cured at ambient temperature and contact pressure. Only Teflon FEP hot-melt adhesive exhibited LOX compatibility. Complete specifications for each adhesive are included in this report. Author

N64-11338* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REFRACTORY COATINGS BIBLIOGRAPHY

David Roller (Magna Corp.) and D. W. Gates Jun. 1962 (rev.) 87 p 657 refs
(NASA TM X-51209) OTS: $8.10 ph, $2.81 mf

This document constitutes a bibliography of reports on the general subject of refractory inorganic materials and, particularly, coating materials for use at temperatures over about 2500° F. Subjects which are related to high-temperature refractory inorganics have also been referenced. Author

N64-11340* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
VACUUM COMPATIBILITY OF ENGINEERING MATERIALS (SOLIDS)
J. B. Gayle, S. V. Caruso, and C. T. Egger 16 Sep. 1963 85 p refs
(NASA TM X-51166; MTP-P&VE-M-63-11) OTS: $8.10 ph, $2.75 mf

The effects of vacuum and elevated temperature on 54 solid materials are reported. Other preliminary results indicate that weight regains on exposure to air subsequent to vacuum testing are small for most materials and are not influenced by the temperature used for the vacuum test. Good correlation of total weight loss generally was noted for results with continuous weighing in standard vacuum systems and those for screening tests utilizing before-and-after-weighing from a vacuum oven. Author

N64-11361 Joint Publications Research Service, Washington, D.C.
ELECTRON MICROSCOPY OF CELLULOSE
Kh. U. Usmanov and G. V. Nikonovich 5 Dec. 1963 308 p refs Transl. into ENGLISH of a book "Elektronnaya mikroskopiya tsellyulozy" Tashkent, Acad. of Sci. Uzbed SSR, 1962 p 1–263
(JPRS-22156; OTS-63-41304) OTS: $5.00

The main portion of the work has been done on the electron microscopy of cotton fibers and the general patterns of the fine structure of cellulose. The morphology of the cotton fiber, the connection between structure and physical and chemical properties, and the connection between the electron microscopic method and other methods of investigating cellulose are discussed. D.E.R.

N64-11374 Hanford Atomic Products Operation, Richland, Wash.
MICROSAMPLING OF IRRADIATED MATERIALS
C. L. Boyd Oct. 1963 17 p refs
(Contract AT(45-1)-1350)
(HW-79122)

Equipment and techniques developed for remote microsampling of irradiated ceramic materials by microdrilling are being used in the study of fission product migration. The equipment includes provisions for readout of sampling locations, remote changing of drills, remote collection of microsamples, magnified visual control of the drilling operation, and micrometer control of drill feed. Samples obtained by microdrilling are analyzed by radiochemical or spectrographic methods; the effect of in-reactor exposure of fuels on fission product migration and segregation of mixtures or alloys is determined. Author

20 MATHEMATICS

Includes calculation methods and theory; computers; data processing; and numerical analysis. *For related information see:* 08 Communications; 09 Electronics; 10 Facilities, Research and Support; and 22 Navigation and Guidance.

N64-10726 Joint Publications Research Service, Washington, D.C.
AUTOMATA AND EVENTS
V. G. Bodnarchuk 28 Feb. 1963 36 p refs Transl. into ENGLISH of an article from Vkr. Mat. Zh. (Kiev), v. 14, Oct. 1962 p 351–361
(JPRS-17879; OTS-63-21228) OTS: $1.00

The possibility of full mechanization of the procedure of abstract synthesis in the presence of corresponding algorithms is considered. Two kinds of special automatic languages are investigated—the language proposed by Medvedev which is designated M, and the language employed by Glushkov which is designated K. The concept of the superposition of events is established as the fundamental principle underlying this study, and the synthesis theorems are investigated in relation to the theorem of the superposition of events. A third language, R, is introduced to establish the relation between the languages M and K. The algorithm of Glushkov's synthesis is interpreted as a transition along the chain K → R → A, where A is the language of the automatic matrices. M.P.G.

N64-10784 Joint Publications Research Service, Washington, D.C.
CYBERNETIC ASPECTS OF STATISTICS
Klaus-Jergen Richter 5 Apr. 1963 15 p refs Transl. into ENGLISH from Statistiche Praxis (E. Berlin), no. 1, Jan. 19 1963 p 15–19

In the investigation of the cybernetic aspects of statistics, the role of statistics as a form of feedback is discussed. This includes an analogy between cybernetics and statistical categories, and a discussion of the types of analogies. Author

N64-10820 Joint Publications Research Service, Washington, D.C.
CERTAIN PROBLEMS IN THE APPLICATION OF THE THEORY OF GAMES TO NAVAL STUDIES
A. P. Tron' 23 May 1963 16 p refs Transl. into ENGLISH from Morskoi Sb. (Moscow), v. 46, no. 1, Jan. 1963 p 23–30
(JPRS-19374; OTS-63-21904) OTS: $0.50

The theory of games is felt to be most useful in the field of tactics and weapons selection. Game theory provides methodologies for the repeated employment of various types of weapons under a specific range of opposition. The problem of determining the composition of the antiaircraft weapons outfit of a group of ships escorting transport vessels, and the positioning of those ships in formation is presented as an example of the use of game theory. R.T.K.

N64-10826 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM AVTOMATYKA (AUTOMATION) [KIEV] NO. 1, 1963
31 May 1963 92 p refs Transl. into ENGLISH of four articles p 10–23; 39–53; 63–66; 70–72
(JPRS-19518; OTS-63-21968) OTS: $2.25

CONTENTS:

1. ON ROSENBLATT'S THEOREMS AND SYSTEMS OF THE PERCEPTRON TYPE H. L. Otkhmezuri p 1–40 refs (See N64-10827 02-20)

2. IMPROVING THE ACCURACY OF THE DIGITAL INTEGRATOR B. O. Sihov p 41–68 refs (See N64-10828 02-20)

3. DEFINITIONS AND CLASSIFICATIONS OF CODES V. A. Stulov p 69–80 (See N64-10829 02-20)

4. AMERICAN RESEARCH ON AUTOMATIC CONTROL THEORY S. F. Kozubovs'kiy p 81–89 (See N64-10830 02-20)

N64-10827 Joint Publications Research Service, Washington, D.C.

ON ROSENBLATT'S THEOREMS AND SYSTEMS OF THE PERCEPTRON TYPE

H. L. Otkhmezuri *In its* Transl. from Avtomatyka (Automation) [Kiev] no. 1, 1963 31 May 1963 p 1–40 refs (See N64-10826 02-20) OTS: $2.25

A machine, called the Perceptron, based on self-regulatory learning concepts, is described. Its operation is similar to that of the human brain; it is able to classify situations arising at the input on the basis of signs which have not been assigned in advance. In discussing the three portions of the Perceptron (the sensitive elements, the associative systems, and the reaction units), some inadequacies of the Rosenblatt theorems of the statistical discrimination of images are indicated. A number of proposals for simplifying the proofs, and extending the applicability of the theorems, are presented. Suggestions for implementing the local (primary) positive feedback to replace the extremum regulator in the Alpha-type recognition system, and for implementing the secondary positive feedback in the recognition system of the Delta-type Perceptron to supplement the self-organization of the sensitive elements, are also included. M.P.G.

N64-10828 Joint Publication Research Service, Washington, D.C.

IMPROVING THE ACCURACY OF THE DIGITAL INTEGRATION

B. O. Sihov *In its* Transl. from Avtomatyka (Automation) [Kiev] no. 1, 1963 31 May 1963 p 41–68 refs (See N64-10826 02-20) OTS: $2.25

Because the digital integrator combines some of the advantages of both digital computers and analog computers and therefore has interesting possibilities for automatic control systems, means of improving the accuracy of these integrators were investigated. It is concluded that a linear interpolator on a digital integrator built on the basis of a frequency divider is able to function using averaging and shifting of error, provided that the error does not exceed the discrete step. Such an integrator is able to integrate with the accuracy defined by the value of the bottom digit, i.e., with the accuracy of a digital integrator with two summators. The error of the digital integrator can be rendered positive or negative as desired. M.P.G.

N64-10829 Joint Publications Research Service, Washington, D.C.

DEFINITIONS AND CLASSIFICATIONS OF CODES

V. A. Stulov *In its* Transl. from Avtomatyka (Automation) [Kiev] no. 1, 1963 31 May 1963 p 69–80 (See N64-10826 02-20) OTS: $2.25

A unified classification of codes is attempted, based on the concept of the coded combination. Each coded combination is compounded of bundles, each consisting of a number of code elements which are transmitted during a timespan whose beginning and end are synchronized. The coded combination, or signal, is represented tridimensionally showing that the basic code parameters are: (1) the frequency of the bundles which are transmitted successively, (2) the number of bundles which are transmitted simultaneously, and (3) the number of elements in each bundle. Four classes of codes are established on this basis: (1) tridimensional codes, in which the three basic parameters may assume any values; (2) two-dimensional codes in which one of the three parameters is equal to unity; (3) one-dimensional codes in which two of the basic parameters equal unity; and (4) dimensionless codes in which all the basic parameters are equal to unity. Examples of each of these types of codes are given. M.P.G.

N64-10830 Joint Publications Research Service, Washington, D.C.

AMERICAN RESEARCH ON AUTOMATIC CONTROL THEORY

S. F. Kozubovs'kiy *In its* Transl. from Avtomatyka (Automation) [Kiev] no. 1, 1963 31 May 1963 p 81–89 (See N64-10826 02-20) OTS: $2.25

Selected papers which were presented by Americans at the Third Joint Conference on Automatic Control held in the U.S.A. on June 27 to 29, 1962, are briefly annotated. M.P.G.

N64-10831 Joint Publications Research Service, Washington, D.C.

ELECTRONIC MODELING

5 June 1963 15 p refs Transl. into ENGLISH of two articles from Dopovidi Akad. Nauk Ukr. RSR (Kiev), no. 4, 1963 p 447–451; 451–453

(JPRS-19563; OTS-63-21983) OTS: $0.50

The synthesis of electronic models for algebraic objects, and a method for modeling differential equations with boundary conditions on an analog computer, are discussed. The electronic-modeling synthesis, which uses current simulation, makes it possible, in some cases, to reduce considerably the required number of amplifiers as compared to conventional methods, provided that all unknowns can be modeled by voltages. When applied to girder systems, this method permits, without exception, the modeling of bulkhead constructions of any configuration and under any loads. The method for modeling simple differential equations on an analog computer is the realization of the Piccard method. The basic schematic of this model includes a model for the differential equations, a cell for memorizing numbers, and a model for algebraic equations. I.v.L.

N64-10832 Joint Publications Research Service, Washington, D.C.

CALCULATION OF CONSTRUCTION SCHEDULES AND PRIORITIES WITH THE AID OF ELECTRONIC COMPUTERS

V. Rybal'skiy 20 June 1963 13 p refs Transl. into ENGLISH of an article from Ekon. Stroit. (Moscow), no. 3, 1963 p 35–42

(JPRS-19768; OTS-63-22082)

A discussion is presented of the use of computers for: (1) establishing the locations and capacities of new industrial enterprise, and the priorities and schedules for their uninterrupted construction, and (2) the development of the transportation network in such a way that consumers could be assured the necessary products, and that the production costs would be minimal. R.T.K.

N64-10833 Joint Publications Research Service, Washington, D.C.

CALCULATION OF DISTRIBUTING NETWORKS WITH THE AID OF THE MINSK DIGITAL COMPUTER

M. S. Levin 12 Nov. 1963 14 p refs Transl. into ENGLISH from Elektrichestvo (Moscow), no. 4, Apr. 1963 p 1–5 (JPRS-19794; OTS-63-31092) OTS: $0.50

A small, high speed, universal digital computer, the Minsk, was designed to aid in solving engineering, scientific, and technical problems. The machine is a two-address, asynchronous parallel computer, with an average speed of 2000 to 3000 operations per minute. The Minsk aids in the electronic calculation of distributing networks. C.L.W.

N64-10845 Joint Publications Research Service, Washington, D.C.

MATHEMATICS AND ELECTRONICS AT THE SERVICE OF THE ECONOMIST

N. Belkin et al 13 Nov. 1963 57 p refs Transl. into ENGLISH from Ekon. Gaz. (Moscow), no. 33, 17 Aug. 1963 p 21–28; p 1–16 of insert
(JPRS-21839; OTS-63-41129) OTS: $1.50

The topics included are: (1) Moscow economic region applies computer technology to improve operational control of production, (2) new Soviet computers, (3) captions to photos of new electronic computer equipment, (4) certain basic concepts in the use of algorithms in the solution of economic problems, (5) calculating the load at each work site for selection of an optimum sequence in flow of parts, (6) the use of computer technology in daily calculation of production costs, (7) a mathematical method devised to improve efficiency of fishing fleets, (8) an automatic warehouse with electronic computer now being designed for large enterprises, (9) magnitogorsk metallurgical combine discovers that preparation of basic data is a major difficulty in use of electronic computers, (10) how to determine the effectiveness of electronic computers in industry, (11) recommended literature on the use of computer technology, and (12) the feasibility of using electronic computers. R.T.K.

N64-10973 Entwicklungsring Sud, Munich (W. Germany)

RELIABILITY REQUIREMENTS OF SUBCONTRACTORS FOR AIRCRAFT DEVELOPMENT [ZUVERLASSIGKEITSFORDERUNGEN AN UNTERLIEFERANTEN BEI FLUGZEUGENTWICKLUNGEN]

Peter Bitter Sept. 1963 31 p refs Presented at the Ann. Meeting of the Wiss. Ges. Luft- und Raumfahrt, Munich, 8–12 Oct. 1963 In GERMAN
(EWR-104-63)

Reliability is a parameter upon which the effectiveness of a weapon system depends. A reliability program can be managed with optimum cost and time if the contractor receives sufficient information from the subcontractor as to the state of the reliability performance, and if the contractor can take certain action in the program planning of the subcontractor. Such a program of central control is based on the premise that proper specifications for the aircraft components are supplied to the subcontractor. I.v.L.

N64-10975* New York U., N.Y.

THE REDUCTION OF AN ARBITRARY REAL SQUARE MATRIX TO TRI-DIAGONAL FORM USING SIMILARITY TRANSFORMATIONS

C. Donald La Budde Repr. from Math. Computation, v. 17, no. 84, Oct. 1963 p 433–437 refs
(NASA Grant NsG-76-60)

In this paper a new algorithm for reducing an arbitrary real square matrix to tridiagonal form using real similarity transformations is described. The method is essentially a generalization of a method due to A. S. Householder for accomplishing the same reduction in the case where the matrix is real and symmetric. Author

N64-10980 European Atomic Energy Community, Brussels (Belgium)

REPORT ON PROGRAMS FOR THE RESOLUTION OF BOOLEAN ALGEBRA EQUATIONS [RAPPORTO SUI PROGRAMMI DI RISOLUZIONE DI EQUAZIONI IN ALGEBRA DI BOOLE]

R. Monterosso Joint Nucl. Res. Center, Ispra Estab. (Italy), Dec. 1962 8 p ref In ITALIAN; ENGLISH abstract
(EUR-126.1; CETIS-12) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 30 Belg. Fr.

The article gives an account of two experiments of resolution of a Boolean equation $\sum_{i=0}^{+} F_i(x_1, x_2 \cdots x_k) = 0$. The first experiment refers to equations with twelve variables carried out on an IBM 704, the second one refers to equations with 36 variables and has been performed on an IBM 7090. The article describes the input–output, the method employed in solving the equations, and the memory layout. In particular, it gives an account of an application of this technique in the study of the circuits in a net. Author

N64-10981 European Atomic Energy Community, Brussels (Belgium)

COLLECTION OF STEMMATA [RECUEIL DE STEMMAS]

Emilie Scheffer Joint Nucl. Res. Center, Ispra Estab. (Italy), Oct. 1963 22 p refs In ITALIAN; ENGLISH abstract
(EUR 220.f; CETIS-29) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 40 Belg. Fr.

This report is an introduction to the problems set for programing the so-called dependence grammars, with concrete examples illustrating the solution proposed. Author

N64-10982 European Atomic Energy Community, Brussels (Belgium)

NUMERICAL RESOLUTION OF THE INTEGRAL TRANSFER EQUATION (NUMERICAL RESOLUTION OF MILNE'S PROBLEM IN AN ABSORBENT MEDIUM) [RISOLUZIONE NUMERICA DELL'EQUAZIONE INTEGRALE DEL TRASPORTO (RISOLUZIONE NUMERICA DEL PROBLEMA DI MILNE IN MEZZO ASSORBENTE)]

B. Montagnini (Soc. AGIP Nucleare) and T. Pomentale Jul. 1963 19 p refs In ITALIAN; ENGLISH abstract
(EUR 372.1)

The integral, monodimensional, homogeneous transport equation is solved, and the minimum eigenvalue c, as well as the next higher eigenvalue, are determined. In the transport equation

$$\rho(x) = \frac{c}{2}\int_0^M E_1(|x - x'|)\,\rho(x')\,dx',$$

M is the thickness of the stratum. The discreteness technique is described; the eigenvalues are sought by means of the power method, with convergence increased by the Aitken technique. Author

N64-10988 California U., Berkeley Operations Res. Center

STOCHASTIC PROGRAMMING

S. M. Sinha 19 Aug. 1963 68 p
(NSF Grants GP-10 and 21034)
(ORC 63-22-(RR))

A stochastic programing problem (where the coefficients of the objective function, the constraint inequalities, and the resources are random variables) is approached probabilistically. With the assumption that at least the means, variances, and covariances of the random variables are known, the problem is reduced to the following convex programing problem: Maximize $D^TX - (X^TB^0X)^{1/2}$, subject to $A_iX + (X^TB^iX)^{1/2} \leq [b_i, A_{m+1}X = b_{m+1}, X] \geq 0$ (1), where A_i $(i = 1, 2, \ldots, m+1)$ are $1 \times (n+1)$, D, X are $(n+1) \times 1$ matrices and B^i $(i = 0, 1, \ldots, m)$ are $(n+1) \times (n+1)$ symmetric positive semidefinite matrices. If all the correlation coefficients are equal to 1, (1) reduces to a linear programing problem with known coefficients. In the particular case when only the coefficients of the objective function are random variables, the problem can be stated as follows: Maximize $D^TX - (X^TBX)^{1/2}$ subject to $AX \leq b$, $X \geq 0$ (2), where A is a $(m \times n)$ matrix, b a $(m \times 1)$ and D , X are $(n \times 1)$ matrices and B is a $(n \times n)$ symmetric positive semidefinite matrix. For the general case (1), Dantzig's Decomposition method for convex programing is applied, and an iterative subproblem arises. Duals to the subproblem of (1) and to problem (2) are established which can be solved by the conventional methods of programing. The primal problems are then solved using the solution for the corresponding dual problem. M.P.G.

N64-10990 Bettis Atomic Power Lab., Pittsburgh, Pa.
SHLOG – A DATA RETRIEVAL PROGRAM FOR THE PHILCO-2000
H. Bohl, Jr. and B. P. Peterson Sep. 1963 57 p refs
(Contract AT(11-1)-GEN-14)
(WAPD-TM-370) OTS: $1.25

SHLOG is a Philco-2000 program which will store on magnetic tape, and retrieve, two related systems of purely numeric data. The retrieved data can be printed, written onto answer filetapes and/or tabulated. The tabulations are in the form of counts of the number of records of a certain class, summations of a particular parameter in each selected record, and normalized statistics which can be used to produce histograms. The format of each data system using the program is variable. The data systems best suited for the program are those which evolve from hundreds of tests performed on many similar experiments, from which system tests, belonging to particular classes, are to be analyzed.
Author

N64-11005 Joint Publications Research Service, Washington, D.C.
SUCCESSIVE APPROXIMATION METHODS FOR SOLVING OPTIMALITY PROBLEMS
12 Feb. 1963 27 p refs Transl. into ENGLISH of two articles from Zh. Vychislitel'noi mat. i Matematichoskoi Fiz. (Moscow), v. 2, no. 6, Nov.–Dec. 1962 p 1132–1144
(JPRS-17589; OTS-63-21110) OTS: $0.75

CONTENTS:

1. ON A METHOD OF SUCCESSIVE APPROXIMATIONS FOR THE SOLUTION OF OPTIMAL CONTROL PROBLEMS I. A. Krylov and F. L. Chernous'ko p 1–14 refs

2 A SUCCESSIVE SEARCH TECHNIQUE FOR THE APPROXIMATE SOLUTION OF CERTAIN OPTIMAL PLANNING PROBLEMS I. B. Motskus p 15–24 refs

N64-11030 Joint Publications Research Service, Washington, D.C.
ALGORITHM FOR TEACHING A MACHINE TO RECOGNIZE THE SIMPLEST GEOMETRICAL FIGURES
V. M. Glushkov, V. A. Kovalevskiy, and V. I. Rybak *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 5–25 refs (See N64-11029 02-01) OTS: $3.00

An algorithm is described for teaching a universal computer to recognize the image of certain simple geometric figures, independently of their size or of their position in the field of vision. The distinguishing characteristics of these figures are the directions of the lines which form their contour. The pattern is thus identified by a group of figures, each of which is proportional to the number of points having a given direction within the contour. During the recognition process, the correlation of these figures is calculated against certain combinations representing "average" patterns for the given geometric figure. The patterns are then identified as belonging to one or another class of figures, according to which standard sample is in the closest correlation with them. The learning process of the computer consists in the automatic determination of standards which would afford maximum recognition of the given figures. I.v.L.

N64-11031 Joint Publications Research Service, Washington, D.C.
ALGORITHM FOR DISCERNING SENTENCE MEANING
B. V. Glushkov, N. M. Grashchenko, and A. A. Stogniy *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 26–38 (See N64-11029 02-01)

This algorithm consists of two parts, E and F. Part E sets up and amplifies lists of active words and of paired combinations of the words contained in the lists. Part F divides words into two classes of nouns and verbs. The algorithm works in the following manner. After parts E and F have completed their work, an examination takes place in which the algorithm is fed sentences composed according to the formula n_1 v' (p,n_2), where n_1 is the subject—noun, v' is the verb—predicate, p is the preposition, and n_2 is the object—noun. It is up to the algorithm to identify each sentence as to whether it makes sense or not. The evaluation of the results of the work with each sentence is fed into the algorithm as special information. The teaching algorithm can be switched into the circuit immediately after algorithms E and F, or it can be connected in the middle of the examination, if the number of erroneous replies and the average length of time the machine requires to process each sentence does not satisfy the "teacher". I.v.L.

N64-11032 Joint Publications Research Service, Washington, D.C.
TEACHING THE RECOGNITION OF CONFIGURATIONS BY MEANS OF FORMAL INDICES
V. I. Varshavskiy and T. N. Semyonova *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 39–56 refs (See N64-11029 02-01)

This report examines an algorithm with variable parameters that can be changed while work is in progress and is designed for the recognition of configurations. The task can be reduced to a formalized problem of dividing two maximal subsets of a single n-dimensional cube, by taking into account the possibility of norming configurations on the basis of their size and position in the field of vision, as well as assuming the binary nature of the receptors. For dividing these subsets, an algorithm is proposed which processes a system containing no more than n normal indices in a space wherein the sets have a definite separating hyperplane. Also given are the results of checking this algorithm experimentally on a digital computer of the URAL-1 type. I.v.L.

N64-11033 Joint Publications Research Service, Washington, D.C.
MODELING OF NATURAL SELECTION IN A COMPUTER
A. A. Letichevskiy and A. A. Dorodnitsyna *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 57–65 (See N64-11029 02-01)

This model consists of an environmental "medium" and "inhabitants" capable of reacting to a change in outside conditions and of performing many types of functions. The environmental medium consists of a finite number of points situated along a circumference. At some specific instant in time, which is altered discretely, the medium finds itself in a specific state with respect to every single point. This state can be one of two kinds, e.g., 0 and 1, with 1 signifying, for instance, that there is food at a given point, and 0 meaning that there is no food at that point. The state of this environmental medium may alter, with time, in accordance with a definite law which is defined. At various points of the medium may be found "inhabitants" capable of moving in either of two directions along the periphery, eating, and reproducing themselves. Each inhabitant is an automat with a finite number of states, the input consisting of information on the state of the medium, and the output consisting of the direction of movement. I.v.L.

N64-11034 Joint Publications Research Service, Washington, D.C.
A PROBLEM OF DYNAMIC PROGRAMMING
Yu. Yu. Finkel'shteyn *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 66–75 (See N64-11029 02-01)

This problem in dynamic programming deals with a certain number of producers, the production of each being dependent on the amount of public capital and on the amount of the producer's own capital. A part of the output produced by a given producer is used to increase his own capital, while the remainder is applied toward an increase of the public capital. Activity of this collective group of producers is controlled by means of assigning retention coefficients, indicating what share of his production the producer may retain for himself. A system of equations is presented which describes the activity of the producers' collective. I.v.L.

N64-11035 Joint Publications Research Service, Washington, D.C.
SOME MATHEMATICAL PROBLEMS IN THE DESIGN OF A DIGITAL LOGICAL COMPUTER
A. A. Stogniy *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 76–92 refs (See N64-11029 02-01)

The operational memory device for a digital logical computer is described, along with the set of required operations for such a computer. These operations are: (1) those with elementary units of information; (2) those with the contents of individual cells; and (3) those with sequences. I.v.L.

N64-11036 Joint Publications Research Service, Washington, D.C.
A GENERAL PURPOSE INSTALLATION FOR THE INVESTIGATION OF IMAGE RECOGNITION ALGORITHMS
V. M. Glushkov, V. A. Kovalevskiy, V. I. Rybak *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 93–109 refs (See N64-11029 02-01)

A general-purpose scanning installation for the investigation of image-recognition algorithms is described. This installation, which is used to feed the information about the drawing into the digital computer, is computer-controlled. Thus, it is possible to model any method of conversion of the drawing. The latter can be drawn on paper with either India ink, ordinary ink, or pencil. There is no need to record the drawing in the memory unit of the computer, i.e., cram its storage capacity with unprocessed information, since the installation makes it possible to turn to any point of the drawing desired, at any given instant. The installation distinguishes sixteen levels of the gray scale, which means that it can process not only line drawings but also half-tones. I.v.L.

N64-11037 Joint Publications Research Service, Washington, D.C.
SOME CATEGORIES OF SELF-ADJUSTING SYSTEMS OF AUTOMATIC CONTROL
A. I. Kukhtenko *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 110–132 refs (See N64-11029 02-01)

Self-adjusting systems of automatic control, the functioning of which is based on a solution of variational problems without additional limitations and with limitations, are discussed. Also, a self-adjusting control system, based on the criterion of invariance, is discussed. These control systems apply to automatic-pilot-controlled aircraft. I.v.L.

N64-11038 Joint Publications Research Service, Washington, D.C.
INDUCTIVE AND DEDUCTIVE METHODS OF COGNITION AS A BASIS FOR BUILDING TWO PRINCIPAL TYPES OF LEARNING SYSTEMS
A. G. Ivakhnenko *In its* Principles of the Design of Self-Learning Systems 21 Oct. 1963 p 133–155 refs (See N64-11029 02-01)

There are two principal types of learning systems, "learning with a teacher" and "self-learning." In automatic control systems of the "learning with a teacher" type, the inductive method is applied in the form of an open circuit based on the use of perturbance signals. In automatic control systems of the "self-learning" type, the deductive method is represented by the use of negative and positive feedbacks. The most advanced learning system, however, is a combination of these two systems. Thus, the general theory of invariance and combined control is fully applicable to the synthesis and analysis of learning systems, and to the calculation of the conditions of invariance for extremal and probability systems. Also, the physical significance of the conditions of invariance for the perceptron is discussed. I.v.L.

N64-11061 Joint Publications Research Service, Washington, D.C.
SEARCH FOR OPTIMAL OPERATING CONDITIONS OF CERTAIN AUTOMATA WITH PROGRAMMED CONTROL
V. S. Avzenshtat 30 Apr. 1963 19 p refs Transl. into ENGLISH of an article from Izv. Akad. Nauk Belorussk. SSR, Ser. Fiz.-Tekh. (Moscow), no. 1, 1963 p 33–41
(JPRS-19007; OTS-63-21728) OTS: $0.50

An automatic galvanizing machine with programed control is described. The assumption is made that the machine consists of a number of baths containing a chemical solution. An overhead transporter moving above the baths transfers baskets with parts from one bath to another in predetermined technological sequences. The problem is to find an operating cyclogram of the transporter at which the productivity of the machine is optimum. An equation is derived for expressing the optimum production process. R.T.K.

N64-11077* Stanford Research Inst., Menlo Park, Calif.
DEVELOPMENT OF TECHNIQUES FOR IMPROVING THE RELIABILITY OF DIGITAL SYSTEMS THROUGH LOGICAL REDUNDANCY, PHASE III Final Report
Jack Goldberg, J. A. Baer and R. C. Minnick Aug. 1963 150 p refs
(NASA Contracts NASw-6 and NAS7-100; JPL Contract N-44501; SRI Proj. 3196)
(NASA CR-52605) OTS: $11.50 ph, $4.70 mf

In the study of reliable memory techniques, consideration is given to the design of recoders for reliable read access switches. The function of such recoders is to convert the code used in the external computer system into the set of signals needed by the power drivers, which in turn drive a fault-masking read access switch. Different circuit techniques are presented, including the use of single-aperture magnetic cores, with and without diodes, and multi-aperture cores. In the study of logical redundancy for Inhibit-Core Logic amplifier protection, it is assumed that the logic elements are perfectly reliable, i.e., that all faults occur in the amplifiers. Since these have only a transmission and detection function, the methods of error-correcting coding for communication channels are applied. In the development of a breadboard version of a reliable transfer circuit, a circuit was developed and built that meets the performance requirements over all specified temperature and power supply conditions in the presence of any single transistor or diode failure, and in the presence of a number of multiple failures. Author

N64-11093 Phillips Petroleum Co., Idaho Falls, Idaho Atomic Energy Div.

COMPUTER GENERATION AND TESTING OF RANDOM NUMBERS

L. J. Gannon and L. A. Schmittroth AEC, Natl. Reactor Testing Station, 20 Aug. 1963 43 p
(Contract AT(10-1)-205)
(IDO-16921) OTS: $1.00

This report discusses the need for random numbers particularly in regard to Monte Carlo applications and the two methods most commonly used to obtain random numbers. These methods are the multiplicative congruential method and the mixed congruential method, and both methods involve somewhat arbitrary parameters. Proofs for the lengths of period for both methods, and a derivation of an expression for the serial correlation coefficient in terms of the parameters of the mixed congruential method are presented. The multiplicative method (for the parameters tested) was found superior to the mixed congruential method. Author

N64-11098* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena

USER GUIDE FOR THE JPL TRAJECTORY MONITOR SYSTEM UNDER THE IBM FORTRAN II, VERSION 2 MONITOR

J. Scott, R. White, L. Laxdal, and A. Rosenberg 9 Aug. 1963 316 p refs
(NASA Contract NAS7-100)
(NASA CR-52600; JPL Sect. Rept. 372-11) OTS: $19.75 ph, $9.68 mf

The Trajectory Monitor System has been recorded on magnetic tapes for distribution. This report is to accompany copies of those tapes and describes the capability of the Trajectory Monitor System, the contents of the recorded information on the magnetic tapes, how a user can transfer this information to cards and printed listings, and how a user can set up, modify, and operate the system. Also included are subroutine writeups, input and output forms and explanations, and results of test cases that can be utilized for comparison purposes. Author

N64-11105* Case Inst. of Tech., Cleveland, Ohio

A TWO-DIMENSIONAL ABSOLUTE DIGITAL PATH CONTROL SYSTEM

William H. Ninke Sep. 1963 153 p refs
(NASA Grant NsG-36-60)
(NASA CR-52686; EDC-1-63-18) OTS: $11.50 ph, $4.79 mf

A two-dimensional path generator which produces absolute digital interpolated path control information from discrete input path points is designed, implemented and tested. The path points are specified at equal intervals of one of the variables. A central interval interpolation scheme is used, i.e., the path in each interval is a section of the third-order polynomial which passes through four successive input path points including the end points of the interval, the previous path point, and the next path point. The polynomials are generated by three connected digital integrators operating upon the respective derivatives of the polynomials. A two-dimensional plotter is constructed which converts the digital outputs of the generator into a graphical record. The combination of the generator and the plotter represents a path control system. Author

N64-11119* Case Inst. of Tech., Cleveland, Ohio Digital Systems Lab.

ANALYSIS AND SYNTHESIS OF TRANSITION-COUPLED ASYNCHRONOUS COUNTERS

Walter Arnstein and Harry W. Mergler Oct. 1963 174 p refs
(NASA Grant NsG-36-60)
(NASA CR-52688; EDC-63-16) OTS: $12.50 ph, $5.42 mf

The transition-coupled asynchronous counter is a single-input sequential circuit containing interstage pulse coupling in the form of transition signals, produced by the memory units in the process of switching. In this study, a logic algebra is introduced for describing the action of a transition-coupled circuit having roughly uniform interstage delays and comparatively small delays due to combinational circuitry. Called subinterval logic, it envisions all action in the circuit as taking place at a finite set of discrete event times. A matrix method for deriving loop equations for transitions in a transition-coupled circuit is described, and a test for inherent stability of the circuit is formulated. A standard-algebraic method for the synthesis of transition-coupled counters is also described. Author

N64-11196* Minneapolis-Honeywell Regulator Co., Minn.

RECURRENCE EQUATIONS AND THE CONTROL OF THEIR EVOLUTION

E. B. Lee Repr. from J. Math. Anal. and Appl., v. 7, no. 1, Aug. 1963 p 118–126 refs
(NASA Contract NASr-27)

The development of procedures for constructing optimum control of processes described by differential equation models is discussed. Three theorems dealing with optimum control are developed about processes where it is assumed that the evolution of the physical system satisfies the real linear recurrence equation: $s^i(r + 1) = A^i_j(r)x^j(r) + B^i_k(r)u^k(r)$, where $k = 1,2,\ldots,m$; $i,j = 1,2,\ldots,n$; and $r = 0,1,2,\ldots$. P.V.E.

N64-11229* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

MULTI-SPEED RESOLVERS FOR ANALOG DIGITAL CONVERSION OF SHAFT ANGLES

H. E. Thomason 9 Jul. 1963 33 p
(NASA TM X-51204; MTP-ASTR-G-63-7) OTS: $3.60 ph, $1.19 mf

The problems associated with accurately measuring platform gimbal angles digitally with the use of a multispeed resolver are discussed. The division of one revolution (2π) into exactly n/2 discrete parts, where n is the number of poles, is a purely digital aspect of the two-speed resolver. If the number of poles could be very large, the system could be considered that of an incremental encoder; then the detailed structure of the fine signal between zeros could be ignored. But, the number of poles is limited by the number of slots that can be put into a lamination of a given size. Therefore, the critical area of the system design is the front end, where the resolver phase clock in combination with zero detectors transforms the input angle Θ into a pulse time. System accuracy is gained or lost here. Author

N64-11250 Amoco Chemicals Corp., Seymour, Ind.

SOLID PROPELLANT BALLISTIC DATA

E. F. Morello Sep. 1963 (Rev. E) 130 p

The LFT series of propellants is relatively cool burning and the combustion products are smokefree, nonerosive, noncorrosive, and nontoxic. Excellent performance in turbomachinery and hydraulic servomechanisms has been demonstrated. The JT propellants have a somewhat higher flame temperature and along with LFT-1 are well suited for prime propulsion in sustainer motors. The SP propellants were developed for space propulsion systems requiring an unusually clean exhaust gas. These propellants are characterized by a relatively high burning rate and superior exhaust gas cleanliness. The GP propellant series was developed for cannon and gun propellant applications, and excellent muzzle velocities with flashless and nonerosive gun operation have been demonstrated in an M-1 rifle. Both granular and extruded forms are available. The P series of propellants is characterized by a hot and nearly neutral gas, and has found application in systems requiring tank pressurization with a nonoxidizable gas source. Author

N64-11265 Joint Publications Research Service, Washington, D.C.

FOREIGN DEVELOPMENTS IN MACHINE TRANSLATION AND INFORMATION PROCESSING NO. 142. ORGANIZATION, APPLICATION OF COMPUTERS IN CODING AND MACHINE TRANSLATION

M. F. Prokof'yev et al 7 Nov. 1963 61 p refs Transl. into ENGLISH of eight articles from Nauchn. -Tekhn. Inform. (Moscow), no. 4, 1963 p 7–11, 13–25, 30–36, 42–43

(JPRS-21764; OTS-63-41083) OTS: $1.50

The following articles are included: (1) Planning Scientific Research on the Basis of Materials of Scientific-Technical Information, (2) the Significance of Scientific-Technical Terminology in the Development of Scientific-Information Activity, (3) Types of Publications of Scientific-Technical Information on Construction and Architecture and the 1963 List of Organizations Authorized as Publishers, (4) the Principle of Inversion in the Operation of Information Search Systems, (5) the Use of Aperture Punched Cards for Information Search—a Bibliographic Search System Using Edge Punched Aperture Cards, (6) a Language for the Recording of Nonalgebraic Algorithms, and (7) Factors Influencing the Quality of the Microimage on "Mikrat-300" Film (microphotographic film). R.T.K.

N64-11307 Deutsche Versuchsanstalt für Luft- und Raumfahrt, Freiburg (W. Germany) Inst. für Angewandte Mathematik und Mechanik

OPTIMUM PRODUCTION PROGRAMMING FOR MULTIPURPOSE EQUIPMENT [EINIGE MODELLE FUR DIE PLANUNG DES PRODUKTIONSPROGRAMMS BEI KONKURRIERENDER PRODUKTION]

P. Hoschka Sep. 1963 51 p refs In GERMAN

(DVL-272) Available from Vereinigte Universitats U. Fachbuckhanlungen, R.-Wagser-Str. 1, Cologne, W. Germany

A model for planning a production program for multipurpose equipment is described. Starting with a model frequently referred to in literature, it is demonstrated how capacity adjustment, cost-spiraling, several production methods, and lot production can be considered in designing a production program. A portion of the problem can be solved mathematically as a problem in linear programing; the other portion can be formulated as a mixed-whole number linear programing problem, or as a linear programing problem with a special nonlinear secondary condition—a so-called alternative-relation. Trans. by [illegible]

N64-11309 European Atomic Energy Community, Brussels (Belgium)

[APPLICATION DE LA THEORIE DES JEUX AUX PROBLEMES D'APPROXIMATION]

P. V. Lambert and M. F. Neuts European Scientific Information Processing Center (Brussels), [Jan.] 1963 29 p refs In FRENCH; ENGLISH Summary Established in co-operation with Louvain U. (Belgium)

(Contract EURATOM 011-61-1-CET-B)

(EUR-124.f; CETIS-54) Available from Belgian American Bank and Trust Co., N.Y., account no. 121.86: 50 Bel. Fr.

Let Φ be the set of functions f to be approximated. Let Θ be a set of approximation operators T, which map Φ on a subset Γ of Φ. Then $g = Tf$ is denoted as the approximation function of the function f, and the approximation error is defined by the values of a certain functional $K(f,T)$, with nonnegative values defined on $\Phi \times \Theta$. Usually $K(f,T)$ will be a form$\|f-Tf\|$. Some optimal approximation criteria are defined, and the problem of finding such optimal approximations is stated by considering the game with zero sum for two persons, where the first player (nature) has Φ, and the second player (the approximator) has Θ as respective sets of pure strategies. The problem is stated precisely in terms of the theory of games, and the theorems of this theory are given which yield computable solutions to the stated problem. Author

N64-11310 European Atomic Energy Community, Brussels (Belgium)

A SYSTEMATIC STUDY OF THE SIMULATION OF TIME DELAYS WITH STANDARD ANALOGUE COMPUTER ELEMENTS [ETUDE SYSTEMATIQUE DE LA GENERATION DE RETARDS AU MOYEN D'UNITES ANALOGIQUES CLASSIQUES]

J. Gamp Joint Nuclear Research Center, Ispra Establishment (Italy). Scientific Data Processing Center [Aug.] 1963 61 p refs In FRENCH; ENGLISH Summary

(EUR-240.f; CETIS-50) Available from Belgian American Bank and Trust Co., N.Y., account no. 121.86: 85 Belg. Fr.

Various methods of approximation of the delay function are known, some of which can be represented by the standard elements of the analog computer. It seemed to be useful to group the latter, to try others using the same equipment (interpolation methods), and finally to select the most interesting cases. A handbook has been prepared illustrating these methods. The choice of the delay function, which depends upon the available equipment, the duration of the delay, and the accuracy required is made easier by two tables. For each delay function the block diagram, the values of the coefficients, patching check values and the region in which machine saturation does not occur are included. Author

N64-11331* Stanford Research Inst., Menlo Park, Calif.

DEVELOPMENT OF TECHNIQUES FOR IMPROVING THE RELIABILITY OF DIGITAL SYSTEMS THROUGH LOGICAL REDUNDANCY Final Report

Jack Goldberg, Robert C. Minnick, and William H. Kautz May 1962 125 p refs

(NASA Contract NASw-6 and JPL-M-44501)

(NASA CR-52866) OTS: $10.10 ph, $3.95 mf

Three major topics are discussed: organization of a computer for efficient use of redundancy techniques, use of redundancy to mask faults in computer memories, and logical redundancy techniques for sequential networks. Author

N64-11332* Alabama U., University Bureau of Engineering Research
A STUDY OF THE STABILITY OF REINFORCED CYLINDRICAL AND CONICAL SHELLS SUBJECTED TO VARIOUS TYPES AND COMBINATIONS OF LOADS. SECTION IV: MATRIX SHEAR LAG ANALYSIS UTILIZING A HIGH-SPEED DIGITAL COMPUTER Summary Report, 28 May 1962-15 Oct. 1962
William K. Rey Nov. 1962 66 p refs
(NASA Contract NAS8-5012)
(NASA CR-52884) OTS: $6.60 ph, $2.18 mf

An analysis of the shear lag problem based upon the Maxwell–Mohr method is presented. Using matrix methods, this Maxwell–Mohr analysis is adapted for solution by a high-speed digital computer. Two numerical examples are presented in which the Maxwell–Mohr analysis is applied to the thrust structure of the C-5 launch vehicle. R.T.K.

N64-11368 Bettis Atomic Power Lab., Pittsburgh, Pa.
MULE– A FORTRAN PROGRAM FOR THE CALCULATION OF THREE TYPES OF OVERTONE MODES
R. L. Ewen Oct. 1963 64 p
(Contract AT(11-1)-GEN-14)
(WAPD-TM-369) OTS: $1.50

The MULE program may be used to find the overtone modes associated with three diffusion-theory eigenvalue problems. Overtone modes are calculated by application of the Wielandt transformation which, by use of an eigenvalue estimate, allows any simple root to be isolated, such that it and the corresponding eigenvector may be determined by power method iteration of the transformed matrix. In addition to finding the eigenvalues and direct fluxes for a series of modes, the MULE program will calculate adjoint fluxes, adjoint weighted integrals, and various reactivity or synthesis parameters. Both slab and cylindrical geometry are included; the slab cores need not be symmetrical, and any radial-azimuthal overtone combination may be determined for cylindrical cores which are uniform azimuthally. Author

N64-11391 Argonne National Lab., Ill.
APPLIED MATHEMATICS DIVISION SUMMARY REPORT, 1 Jul. 1962-30 Jun. 1963
William F. Miller [1963] 104 p refs
(Contract W-31-109-ENG-38)
(ANL-6768)

A summary report is presented which concerns the organization of personnel, computer programs, programing systems and library routines, computer engineering and equipment, publications and papers, seminars, symposia and lecture courses in computer applications and logical design, and the computer services council. C.L.W.

N64-11404 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
CERTAIN QUESTIONS ON THE OSCILLATION OF THE SOLUTIONS OF SECOND ORDER NONLINEAR NON-AUTONOMOUS EQUATIONS
V. N. Shevelo and V. G. Shtelik Sep. 1963 11 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSSR (Moscow), v. 149, no. 2, 1963 p 276–279
(*Its* Transl. 465)

The types of motion for nonlinear second-order differential equations are classified. Certain generalizations on the classical Sturmian theory of linear second-order equations are obtained, particularly with regard to oscillation theorems. Author

N64-11406 Rochester U., N.Y.
GENERALIZED SHMUSHKEVICH METHOD: PROOF OF BASIC RESULTS
A. J. Macfarlane, N. Mukunda (Atomic Energy Estab., India) and E. C. G. Sudarshan (Bern U., Switzerland) 24 Oct. 1963 25 p refs Submitted for Publication
(Contract AT(30-1)-875)
(URPA-15)

Certain orthogonality properties of the Clebsch-Gordon (CG) coefficients of an arbitrary compact group are derived. It is recognized that the irreducible representations (IR) of G need not be equivalent to their complex conjugates, and that the same IR can appear more than once in the reduction of the direct product of two IR of G. The properties obtained allow the development of a generalized Shmushkevich method for directly writing down consequences of the invariance of particle interactions under G. The discussion given is wide enough to apply to the currently interesting cases of SU_3 and G_2. Author

N64-11426 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
CERTAIN CASES OF THE INTEGRABILITY OF THE EQUATIONS OF MOTION OF THE MATERIAL POINT UNDER THE ACTION OF THE NEWTONIAN FORCE AND ADDITIONAL PERTURBATION FORCES
K. G. Valeev [1963] 12 p refs Transl. into ENGLISH from Prikl. Matemat. i Mekh. (USSR), v. 27, no. 2, 1963 p 211–217
(*Its* Transl. 459)

The integrability of the equations of motion of the material point under the action of the Newtonian force and additional perturbation forces is given. Included was integration in the particular case of external forces, and in cases on the integrability of equations of motion, when the additional force F is directed along the velocity dr/dt of the moving point M. C.L.W.

21 METEOROLOGY

Includes climatology; weather forecasting; and lower atmosphere studies. *For related information see*: 05 Astronomy and Astrophysics; 12 Geophysics; and 29 Space Sciences.

N64-10754 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM METEROLOGIYA I GIDRROLOGIYA (METEOROLOGY AND HYDROLOGY) [MOSCOW] NO. 1, JANUARY 1963
25 Mar., 1963 59 p refs Transl. into ENGLISH of 11 articles p 3–24; 47; 53–55; 59–62
(JPRS-18306; OTS-63-21397) OTS: $1.50

CONTENTS:

1. INVESTIGATION OF THE STRATOSPHERE IN THE USSR BY MEANS OF METEOROLOGICAL ROCKETS I. A. Khvostikov, M. N. Izakov, G. A. Kokin, Yu. V. Kurilova, and N. S. Livshits p 1–10 refs

2. STATISTICAL ENTROPY AS AN INDEX OF SIMILARITIES OR DIFFERENCES OF METEOROLOGICAL FIELDS N. A. Bagrov p 11–21 refs

3. THE QUANTITATIVE METHOD FOR DETERMINING THE DATE OF THE BEGINNING OF A NATURAL SYNOPTIC PERIOD S. T. Pagava p 22–35 refs

4. DECREASE IN RADIATION ERRORS WHEN MEASURING AIR TEMPERATURE WITH THE RKZ-1A RADIOSONDE G. N. Kostyanoy and A. I. Kruglova p 36–37 refs

5. TELEMETRY IN FOREIGN OCEANOGRAPHY V. M. Lifshits p 38–44 refs

6. AT THE INSTITUTES OF THE MAIN ADMINISTRATION OF THE HYDROMETEOROLOGICAL SERVICE p 45

7. AT THE INSTITUTES OF THE MAIN ADMINISTRATION OF THE HYDROMETEOROLOGICAL SERVICE p 46–49

8. CONFERENCES, MEETINGS AND SEMINARS p 50–51

9. INTERNATIONAL EXPEDITION IN THE INDIAN OCEAN p 52

10. CONCERNING ANTARCTICA p 53–54

11. NOTES ON INTERNATIONAL SCIENTIFIC LIFE p 55–56

N64-10762 Joint Publications Research Service, Washington, D.C.
RESEARCH ON CLOUD STRUCTURE AND THE SCIENTIFIC TASKS CONNECTED WITH THE INTERNATIONAL YEAR OF THE QUIET SUN
A. Kh. Khrgian *In its* Soviet Geophys. and Meteorol. Res. in 1962 28 Mar. 1963 p 9-28 refs (See N64-10760 02-01) OTS: $1.00

Modern knowledge of the macrophysics of clouds and their electric and other properties is surveyed. Future research and organization of cloud observations in the U.S.S.R. are outlined. Author

N64-10763 Joint Publications Research Service, Washington, D.C.
STATISTICAL CHARACTERISTICS OF THE HORIZONTAL COMPONENT OF WIND VELOCITY AT ALTITUDES OF 6 TO 12 KM
N. Z. Pinus *In its* Soviet Geophys. and Meteorol. Res. in 1962 28 Mar. 1963 p 29–37 refs (See N64-10760 02-01) OTS: $1.00

This article gives the results of experimental investigations of spatial fluctuations of the horizontal component of wind velocity at altitudes of 6 to 12 km, the correlation coefficients and spectral functions, and their mathematical approximation. It is shown that the "minus 5/3 law" is correct for scales of horizontal motions to the order of several tens of kilometers. Author

N64-10794 Joint Publications Research Service, Washington, D.C.
TRANSLATION FROM METEOROLOGIYA I GIDROLOGIYA (METEOROLOGY AND HYDROLOGY) [MOSCOW] NO. 2, 1963
22 Apr. 1963 32 p refs Transl. into ENGLISH of two articles p 3–14; 21–29
(JPRS-18830; OTS-63-21635) OTS: $1.00

CONTENTS:

1. AIR EXCHANGE IN THE TROPICAL ZONE AND ITS RELATIONSHIP TO THE GENERAL CIRCULATION OF THE ATMOSPHERE A. R. Kats p 1–17 refs

2. THE TEMPERATURE FIELD IN A SYSTEM OF DEVELOPING PRESSURE FORMATIONS IN THE LOWER STRATOSPHERE IN WINTER A. A. Pavlovskaya p 18–29 refs

N64-10835 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM METEOROLOGIYA I GIDROLOGIYA (METEOROLOGY AND HYDROLOGY) [MOSCOW], NO. 4, 1963
A. F. Dyubyuk et al 26 June 1963 64 p refs Transl. into ENGLISH of 11 articles p 3–15, 34–39, 42–44, 54–57, and 59–63
(JPRS-19879; OTS-63-31128) OTS: $1.75

In the areas of meteorology and hydrology the following topics were discussed: certain physical properties of orographic altocumulus lenticular clouds; objective analysis of certain meteorological elements with the use of statistical characteristics; training of meteorologists; development problems of the hydrological forecast service; problem of measurement of long-wave balance; literature on meteorology and hydrology; main administration of the hydrometeorological service; expeditionary research in the Far East; and scientific research establishments of the hydrometeorological service. C.L.W.

N64-10843 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM METEOROLOGIYA I GIDROLOGIYA (METEOROLOGY AND HYDROLOGY) [MOSCOW], NO. 6, 1963
N. A. Belinskiy et al 29 Jul. 1963 53 p refs Transl. into ENGLISH of 10 articles
(JPRS-20398; OTS-63-31407) OTS: $1.50

The following articles are included: (1) Calculation of the Distribution of Water Temperature along a Verticle Line, (2) Influence of Temperature Anomalies on the Ice Cover of the Arctic, (3) Computation of Baroclinic Depth, (4) The Organization and Methods Used in Expeditionary Hydrological Work at the Mouth of a River, (5) Literature on Meteorology and Hydrology for 1962, and (6) Automation in Hydrology. R.T.K.

N64-10914* Armour Research Foundation, Chicago, Ill.
MEASUREMENT OF ATMOSPHERIC TEMPERATURE BY RADIOMETER
D. Fryberger *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 50-56 ref (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

An inversion technique is discussed which permits the deduction of a temperature profile from interpreted readings. The power received by the radiometer, in this case, can be related to an integrated temperature by the Nyquist noise relationship. L.v.L.

N64-10915* Massachusetts Inst., of Tech., Cambridge
ABSORPTION AND EMISSION BY ATMOSPHERIC WATER VAPOR
Victor K. Chung *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 57–75 refs (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

The line shape of water vapor at 1.35 cm, which is the K-band, was investigated. The calculations involved begin with the Van Vleck line-broading formula in which the main parameter is the line width. Because the intensity in the center of the line is proportional to the density of the molecules over the line width, this parameter of the line determines not only the shape but also the intensity of the line. The numbers for the line width were taken from the paper by Becker and Autler, who made measurements at a pressure of one atmosphere at 318° K. Their results were extrapolated for the range of pressure and temperature which is in the earth's atmosphere. The results obtained from this investigation were the ones predicted for a microwave radiometer looking down from a satellite. I.v.L.

N64-10917* Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
MICROWAVE RADIOMETRY AND CLOUD LIQUID-WATER CONTENT
L. Wijnberg *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 81–82 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

Microwave radiometry and cloud liquid-water content are reviewed. For clouds with a substantial quantity of liquid water, i.e., 1 to 10 g/cm^3, it can be shown that the thermal radiation, as sensed by a radiometer, comes primarily from cloud water droplets, not from gas and vapor molecules. Furthermore, if the operating wavelength is large compared to the radius of the cloud droplets, the absorption coefficient can be shown to vary inversely as the square of the wavelength. I.v.L.

N64-10918* Geophysics Corp. of America, Bedford, Mass.
COMMENTS ON HEIGHT RESOLUTION OF RADIATION
J. I. F. King *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 86–89 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

An explanation, based on the basic transfer equation, is presented for quoting 10 to 15 km as the approximate height resolution of the radiation from an externally viewed atmosphere. I.v.L.

N64-10923* Lincoln Lab., Mass. Inst. of Tech., Lexington
MEASUREMENT OF SEA STATE
M. L. Meeks *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 175-179 ref (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

The importance of measurements with satellite radiometers at wavelengths of about 3 to 4 cm is discussed. Looking at the earth from a polar-orbiting satellite at a wavelength of about 3 cm would provide considerable information important to meteorology. By looking at a perfectly black body, it is possible to see the temperature of the sky. If the surface is a perfect reflector, the temperature of the sky can also be seen. In looking at the surface of the sea, emission arising from underneath the surface and from reflection from the atmosphere can be seen. It is possible that the apparent temperature of the sea is at least partially a function of sea state. I.v.L.

N64-10924* Weather Bureau, Washington, D.C.
INVERSION METHODS
D. Q. Wark *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 180–194 refs (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

Two inversion techniques for deriving temperature profiles are presented. These are the Yamamoto and the Wark Techniques. The accuracy of these techniques, and the error propagation, are discussed. I.v.L.

N64-10925* Space-General Corp., El Monte, Calif.
INTRODUCTION [TO SESSION ON PRESENT AND FUTURE RESEARCH AND EXPERIMENTS]
R. M. Stewart *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 196–200 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

A passive microwave terrain-scanning system is discussed. The system was installed in a highly instrumentated B-25. The radiometer scanning antenna was in the tail of the aircraft and was pointed down at an angle of approximately 45°. As the aircraft flew along a selected course, the antenna beam swept across the flight path approximately 45° to either side of the center line. The flight altitude, which was always between 9 and 10 thousand feet, is believed to be by far the highest altitude from which passive microwave terrain pictures have been made. Patterns obtained under various terrains and weather conditions are discussed. I.v.L.

N64-10926* Space-General Corp., El Monte, Calif.
FURTHER EXPERIMENTS
C. U. Falco *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 201–209 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

Microwave-radiometer pictures taken during flight tests are discussed. These pictures include: (1) a high thermal contrast target—composite positive-negative gradient radiometric maps made of a river area during rainy and clear weather conditions; (2) soil composition boundaries—positive- and negative-gradient radiometric maps of the same area; (3) soil composition boundaries at night, at dawn, and during the day—positive gradients; and (4) soil composition boundaries at night, at dawn, and during the day—negative gradients. These pictures illustrate that the microwave radiometer was sufficiently sensitive, and that a low-resolution "gradient" system makes repeatable maps possible. I.v.L.

N64-10928* Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
A MILLIMETER-WAVE RESEARCH PROGRAM IN CLOUD PHYSICS
L. Wijnberg *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 213–217 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

A proposed millimeter-wave research program in cloud physics is described. The plan is to place the radiometer on the ground and to angularly scan the sky or the cloud deck. Situations with adequate cloud stratification will be required for obtaining the best possible results. Data will be gathered as a function of the cosine of the viewing angle, and then a typical inversion will be attempted. The success of the data processing will be tested against Weather Bureau radiosonde data. I.v.L.

N64-10931* RAND Corp., Santa Monica, Calif.
METEOROLOGICAL SATELLITES AND NUMERICAL WEATHER PREDICTION Appendix
Yale Mintz *In its* The Appl. of Passive Microwave Technol. to Satellite Meteorology: A symp. Aug. 1963 p 241–253 refs (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

Numerical weather prediction consists of replacing, by their finite analogs, the differential equations that govern the changes in the state of the atmosphere and integrating the difference equations numerically. This report discusses the specific relation between meteorological satellites and numerical weather prediction. I.v.L.

N64-10985 Mc Gill U., Montreal (Canada)
WHAT ARE THE CAUSES OF THE ALEUTIAN ANTICYCLONE?

B. W. Boville 15 p refs Repr. from Meteorol. Abhandl. (Berlin), v. 36, 1963 Proc. of the Intern. Symp. on Stratospheric and Mesospheric Circulation, Berlin, 20–31 Aug. 1962 p 107–119

The abnormally warm temperatures, and high geopotential heights of the fluctuating polar-night westerlies, are examined as the major components of the Aleutian anticyclone.
J.E.T.

N64-10992 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM METEOROLOGIYA I GIDROLOGIYA (METEOROLOGY AND HYDROLOGY) [MOSCOW] No. 11, 1962

1 Feb. 1963 65 p refs Transl. into ENGLISH of selected articles p 20–27; 33–36; 39–42; 52–53
(JPRS-17424; OTS-63-21036) OTS: $1.75

CONTENTS:

1. PECULARITIES OF THE FIELD NEAR CUMULONIMBUS CLOUDS S. M. Shmeter p 1–10 (See N64-10993 02-21)
2. METHOD OF DETERMINING TURBULENCE CHARACTERISTICS IN JET STREAMS N. Z. Ariyel' and E. K. Byutner p 11–18 refs (See N64-10994 02-21)
3. PROCESSING TV CLOUD PICTURES OBTAINED WITH METEOROLOGICAL SATELLITES F. Vel'tishchev p 19–27 refs (See N64-10995 02-21)
4. NEW FORMS OF WEATHER SERVICE FOR THE CIVIL AIR FLEET A. V. Brodskiy p 28–30 refs (See N64-10996 02-21)

N64-10993 Joint Publications Research Service, Washington, D.C.

PECULIARITIES OF THE WIND FIELD NEAR CUMULONIMBUS CLOUDS

S.M. Shmeter *In its* Transl. from Meteorol. i Gidrol. (Meteorology and Hydrol.) [Mos^ow] no. 11, 1962 1 Feb. 1963 p 1-10 refs (See N64-10992 02 21) OTS: $1.75

Studies were made of peculiarities of the horizontal structure of the fields of temperature, wind, and turbulence near the upper third of Cb, (cumulonimbus clouds). Disturbances in the wind field close to the side surface of the Cb were investigated. Measurements were made of the different values of the average rate of relative inflow (outflow) of air $|\bar{v}_n|$ through the side surface of the Cb. A characteristic of the processes of inflow (outflow) of air at the edges of a Cb is the dependence of their intensity on the following factors: (1) the magnitude of the vertical gradient (shift) of the wind in the layer of convection, and (2) the stage of development of the cloud. Observations demonstrated that the field of disturbances around the cloud is asymmetrical; this asymmetry exerts a considerable influence on the dynamics of development of Cb clouds. A diagram is presented of the horizontal flows around Cb clouds. Over growing and mature Cb's, the wind velocity is increased in comparison with the zone outside the cloud. Disturbances of the wind field in the very upper edge of growing Cb's can also be brought about by the effect of intensified vertical turbulent mixing.
R.T.K.

N64-10994 Joint Publications Research Service, Washington, D.C.

METHOD OF DETERMINING TURBULENCE CHARACTERISTICS IN JET STREAMS

N. Z. Ariyel' and E. K. Byutner *In its* Transl. from Meteorol. i Gidrol. (Meteorology and Hydrol.) [Moscow] no. 11, 1962 1 Feb. 1963 p 11–18 refs (See N64-10992 02-21) OTS: $1.75

An estimation is made of the values of the coefficient of turbulence k and gustiness c' of the wind in jet streams from the data of a vertical temperature-wind sounding of the atmosphere. The method of calculation of the k and c' values is presented, and an example of the use of the method for calculation of the profiles of wind and temperature in a jet stream is included.
R.T.K.

N64-10995 Joint Publications Research Service, Washington, D.C.

PROCESSING TV CLOUD PICTURES OBTAINED WITH METEOROLOGICAL SATELLITES

F. Vel'tishchev *In its* Transl. from Meteorol. i Gidrol. (Meteorology and Hydrol.) [Moscow] no. 11, 1962 1 Feb. 1963 p 19-27 refs (See N64-10992 02-21) OTS: $1.75

A discussion is presented of methods of: (1) attaching television images (transmitted by artificial earth satellites) to a locality, and (2) eliminating the distortion that arises. The coordinates of a satellite are given, by which the attachment of the photographs to a locality is accomplished. The elimination of distortions is accomplished by means of perspective grids. A description is also given of the process by which charts are made of the television images.
R.T.K.

N64-10996 Joint Publications Research Service, Washington, D.C.

NEW FORMS OF WEATHER SERVICE FOR THE CIVIL AIR FLEET

A. V. Brodskiy *In its* Transl. from Meteorol. i Gidrol. (Meteorology and Hydrol.) [Moscow] no. 11, 1962 1 Feb. 1963 p 28-36 refs (See N64-10992 02-21) OTS: $1.75

A description is given of forms, containing meteorological information, that are given to pilots before each flight. Prognostic charts of special weather phenomena and prognostic height maps are the bases of this form. The meteorological conditions under which the flight must be completed are stated in the form.
R.T.K.

N64-11045 Joint Publications Research Service, Washington, D.C.

ATMOSPHERIC POLLUTION

Jan Juda and Karol Budzinski 31 Mar. 1963 267 p refs Transl. into ENGLISH of the book "Zanieczyszczenia Atmosfery", Warsaw, Wydawnicstwa Naukowo-Techniczne, 1961 p 1–256
(JPRS-18455; OTS-63-21460) OTS: $4.00

CONTENTS:

PART ONE: GENERAL INFORMATION

1. SYSTEMATIC CLASSIFICATION OF ATMOSPHERIC POLLUTANTS J. Juda and K. Budzinski p 1–16 refs (See N64-11046 02-21)
2. SOURCES OF ATMOSPHERIC POLLUTANTS J. Juda and K. Budzinski p 17–55 refs (See N64-11047 02-21)
3. DAMAGE CAUSED BY ATMOSPHERIC POLLUTION J. Juda and K. Budzinski p 56–66 refs (See N64-11048 02-21)

PART TWO: DISPERSION OF POLLUTANTS IN THE ATMOSPHERE

4. AEROSOL MECHANICS J. Juda and K. Budzinski p 67–82 refs (See N64-11049 02-21)
5. THE INFLUENCE OF METEOROLOGICAL CONDITIONS ON THE DISPERSION OF POLLUTANTS J. Juda and K. Budzinski p 83–103 refs (See N64-11050 02-21)

6. DISPERSION OF POLLUTANTS IN THE ATMOSPHERE J. Juda and K. Budzinski p 104–171 refs (See N64-11051 02-21)

PART THREE: TESTING OF ATMOSPHERIC POLLUTANTS

7. METHODS OF MEASURING ATMOSPHERIC POLLUTION J. Juda and K. Budzinski p 172–187 refs (See N64-11052 02-21)

8. DETERMINATION OF POLLUTANT EMISSION J. Juda and K. Budzinski p 188–212 refs (See N64-11053 02-21)

9. ESTIMATION OF DUSTFALL J. Juda and K. Budzinski p 213–233 refs (See N64-11054 02-21)

10. DETERMINATION OF PARTICULATE MATTER CONCENTRATION IN AIR J. Juda and K. Budzinski p 234–248 refs (See N64-11055 02-21)

11. DETERMINATION OF GASEOUS AIR POLLUTANTS J. Juda and K. Budzinski p 249–260 refs (See N64-11056 02-21)

N64-11046 Joint Publications Research Service, Washington, D.C.

SYSTEMATIC CLASSIFICATION OF ATMOSPHERIC POLLUTANTS

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 1–16 refs (See N64-11045 02-21) OTS: $4.00

The topics considered are: definition of atmospheric pollutants, systematic classification of dusts and mists, characteristic parameters of atmospheric pollutants, and characteristic air pollutants. R.T.K.

N64-11047 Joint Publications Research Service, Washington, D.C.

SOURCES OF ATMOSPHERIC POLLUTANTS

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 17–55 refs (See N64-11045 02-21) OTS: $4.00

The following topics are included: (1) systematic classification of the sources of atmospheric pollutants, (2) natural sources of atmospheric contaminants, (3) sources of artificial atmospheric pollutants, (4) concentration of atmospheric pollutants, and (5) air-pollution legislation. R.T.K.

N64-11048 Joint Publications Research Service, Washington, D.C.

DAMAGE CAUSED BY ATMOSPHERIC POLLUTION

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 55–66 refs (See N64-11045 02-21) OTS: $4.00

The topics discussed are: (1) material losses, (2) indirect losses due to pollution, (3) direct losses due to pollutants, (4) a general estimate of losses caused by atmospheric pollution, and (5) the effect of pollutants on humans. R.T.K.

N64-11049 Joint Publications Research Service, Washington, D.C.

AEROSOL MECHANICS

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 67–82 refs (See N64-11045 02-21) OTS: $4.00

A discussion of the following topics is presented: (1) uniform motion of particulates, (2) shape coefficient, (3) the settling velocity of dust particles, (4) Brownian motion, and (5) the general conditions of the movement of solid particles. R.T.K.

N64-11050 Joint Publications Research Service, Washington, D.C.

THE INFLUENCE OF METEOROLOGICAL CONDITIONS ON THE DISPERSION OF POLLUTANTS

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 83–103 refs (See N64-11045 02-21) OTS: $4.00

The following topics are discussed: (1) the influence of wind velocity on the dispersion of pollutants, (2) vertical temperature gradient, (3) vertical wind-velocity gradient, (4) fluctuations in wind velocity, (5) mean wind direction and deviations, and (6) the Richardson number and the phenomenon of atmospheric diffusion. R.T.K.

N64-11051 Joint Publications Research Service, Washington, D.C.

DISPERSION OF POLLUTANTS IN THE ATMOSPHERE

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 104–171 refs (See N64-11045 02-21) OTS: $4.00

Among the topics discussed are: (1) calculation formulas for the individual types of emission sources, (2) calculation of dustfall, (3) the influence of meteorological precipitation on the concentration and fallout of particulate matter, (4) coagulation of dust particles in air, (5) the effect of topography on the dispersion of pollutants in the atmosphere, (6) graphs and nomograms for determining dispersion of pollutants. R.T.K.

N64-11052 Joint Publications Research Service, Washington, D.C.

METHODS OF MEASURING ATMOSPHERIC POLLUTION

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 172–187 refs (See N64-11045 02-21) OTS: $4.00

The topics discussed are: (1) choice of monitoring locations, (2) duration of sampling, (3) accuracy of measurements, (4) methods of compilation and analysis of results, and (5) establishment of correlation between the individual parameters of atmospheric pollution. R.T.K.

N64-11053 Joint Publications Research Service, Washington, D.C.

DETERMINATION OF POLLUTANT EMISSION

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 188–212 refs (See N64-11045 02-21) OTS: $4.00

The topics discussed are: (1) general principles of determining emissions of particulates, (2) the possibility of automatic sampling of particulate matter concentrations in industrial gases, and (3) measurement of gaseous pollutant emissions. R.T.K.

N64-11054 Joint Publications Research Service, Washington, D.C.

ESTIMATION OF DUSTFALL

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 213–233 refs (See N64-11045 02-21) OTS: $4.00

The topics discussed are: (1) dustfall meters, (2) collecting plates, (3) directional dustfall samplers, (4) a comparison of the various methods of dustfall measurement, (5) determination of the source of origin of particulate matter, and (6) physical and chemical testing. R.T.K.

N64-11055 Joint Publications Research Service, Washington, D.C.

DETERMINATION OF PARTICULATE MATTER CONCENTRATION IN AIR

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 234–248 refs (See N64-11045 02-21) OTS: $4.00

The topics discussed are: (1) measuring filters for the direct determination of particulate matter concentrations, (2) electrostatic samplers, (3) filters for the indirect estimation of particulate matter concentrations, and (4) automatic konimeters.

R.T.K.

N64-11056 Joint Publications Research Service, Washington, D.C.

DETERMINATION OF GASEOUS AIR POLLUTANTS

Jan Juda and Karol Budzinski *In its* Atmospheric Pollution 31 Mar. 1963 p 250–260 refs (See N64-11045 02-21) OTS: $4.00

The topics discussed are: (1) classification of sampling methods, and (2) determination of individual gaseous pollutants among which are sulfur compounds, hydrogen fluoride, chlorine compounds, oxides of nitrogen, and carbon monoxide.

R.T.K.

N64-11125 Joint Publications Research Service, Washington, D.C.

HYDRODYNAMIC CALCULATION OF THE OROGRAPHIC CLOUDINESS IN A STABLE AND UNSTABLE ATMOSPHERE

Kh. N. Zeytunyan 9 May 1963 10 p refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 148, no. 3, 1963 p 585–588
(JPRS-19119; OTS-63-21791) OTS: $0.50

A survey is made of the characteristics of unstable atmospheric stratification, and a comparison is made between stable and unstable cases. On the basis of formulas that are derived, the following calculations were made: (1) the distribution of vertical currents over Holland in conditions of stable and unstable atmospheric strata, and (2) the determination of zones of precipitation over Holland, for both stable and unstable atmospheric conditions. R.T.K.

N64-11126 Joint Publications Research Service, Washington, D.C.

THE ARTIFICIAL CONTROL OF THE CLIMATE OF LARGE AND SMALL AREAS

A. A. Dmitriyev 13 May 1963 16 p refs Transl. into ENGLISH of an article from Izvest. Akad. Nauk SSSR, Ser. Geol. (Moscow), no. 1, 1963 p 45–49
(JPRS-19145; OTS-63-21801) OTS: $0.50

The problems considered are: (1) climate control of the entire planet (earth), by regulating the incident solar energy, and (2) climate control over local geographic areas. A discussion is presented of the projects involved in controlling the climate in the western coastal desert area of Issyk-Kul Lake where frequent hurricane-type winds occur. R.T.K.

N64-11166 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

TRANSACTIONS OF THE CENTRAL AEROLOGICAL OBSERVATORY (SELECTED ARTICLES)

I. I. Gayvoronskiy et al 19 Aug. 1963 41 p refs Transl. into ENGLISH from Tr. Tsentr. Aerolog. Observ. (Moscow), no. 44, 1962 p 15–37
(FTD-TT-63-633/1+2+4; AD-420614)

CONTENTS:

1. EXPERIMENTS ON THE DISSIPATION OF CLOUDS OVER LARGE AREAS I. I. Gayvoronskiy and Yu. A. Seregin p 1–24 (See N64-11167 02-21)

2. DISSIPATION OF SUPERCOOLED FOG FROM THE GROUND I. I. Gayvoronskiy and Yu. A. Seregin p 25–38 refs (See N64-11168 02-21)

N64-11167 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

EXPERIMENTS ON THE DISSIPATION OF CLOUDS OVER LARGE AREAS

I. I. Gayvoronskiy and Yu. A. Seregin *In its* Trans. of the Central Aerological Obs. 19 Aug. 1963 p 1–24 (See N64-11166 02-21)

Set forth briefly in the article are the results of the seeding of supercooled clouds and fog over large areas (up to 10,000 km^2) using solid carbon dioxide as the reagent. The experiments have established the possibility of dissipating clouds and fog over such areas under definite meteorological conditions. Author

N64-11168 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

DISSIPATION OF SUPERCOOLED FOG FROM THE GROUND

I. I. Gayvoronskiy and Yu. A. Seregin *In its* Trans. of the Central Aerological Obs. 19 Aug. 1963 p 25-38 refs (See N64-11166 02-21)

The article deals with the results of experiments on the dissipation of supercooled fog from the ground using solid carbon dioxide as the reagent. A description of the various types of apparatus used to introduce the reagent into the fog is presented. Author

N64-11170 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

BASIC CHARACTERISTICS AND TENDENCIES IN THE DEVELOPMENT OF MODERN INSTRUMENTS FOR MEASURING HEIGHT OF LOWER EDGE OF CLOUDS

N. S. Bozhevikov and L. A. Shestopalov 11 Sep. 1963 13 p refs Transl. into ENGLISH from Meteorol. i Gidrol., (Moscow), no. 5, 1963 p 45–50
(FTD-TT-63-779/1+2; AD-422448)

A description is given of the light-impulse (light-locating) and projector trigonometric units that are being developed and put into operation for the purpose of determining the height of the lower edge of clouds. R.T.K.

N64-11181 Chicago U., Ill.

AN INVESTIGATION OF THE STRUCTURE OF CLOUD AND WEATHER SYSTEMS ASSOCIATED WITH CYCLONES IN THE UNITED STATES

Dorothy L. Bradbury, E. Paul Mc Clain, Yukio Omoto, Gandikota V. Rao, Eugene R. Ternes et al Sep. 1963 133 p refs
(Contract AF 19(604)-7230)
(Sci. Rept. 11; AFCRL-63-716; AD-422591)

Seven different synoptic situations in the United States have been analyzed, particularly with a view to obtaining detailed descriptions of vertical structures and evolutionary aspects of cloud systems associated with extratropical cyclones. Substantial differences were found amongst the storms investigated, and agreement with the cloud structure of the classical cyclone models was generally poor. Some of the differences may be ascribed to the great variety of patterns of circulation and moisture brought about by large-scale orographic influences, while others appear to be of a more general nature. In particular, the multilayer cloud structure that was found to be prominent in all storms suggests the existence of complex vertical circulations with several levels of nondivergence. Attempts at generalizing the results of the analyses into model structures proved unprofitable on account of large variability within the relatively small sample of cases. This paper, therefore, describes each case as an individual occurrence. Author

N64-11182 Chicago U., Ill.
AN INVESTIGATION OF PRE-FRONTAL PRECIPITATION ZONES
Yukio Omoto Sep. 1963 100 p refs
(Contract AF 19(604)-7230)
(Sci. Rept. 12; AFCRL-63-717; AD-422398)

The emphasis is on prefrontal precipitation zones in which convective activity plays no important part. Two nonconvective winter cases are described in great detail and compared with analyses of early-summer cases in which convective systems were predominant. The vertical distributions of vertical motion, horizontal moisture convergence, and rate of condensation are evaluated for the nonconvective cases. Detailed analyses of cloud structures are presented, and a model structure of prefrontal precipitation systems is proposed. A comparison of the convective and nonconvective cases is made in regard to large-scale synoptic situations, and a number of similarities and dissimilarities are described. Author

N64-11333 Geophysics Corp. of America., Bedford, Mass.
STUDIES OF REVISED AND SUPPLEMENTARY ATMOSPHERES AND STRUCTURES AND VARIABILITY OF THE EARTH'S ATMOSPHERE Final Report
Jun. 1963 102 p refs
(NASA Contract NASw-394; AF 19(628)-1633)
(NASA CR-52868; GCA TR-63-18-N) OTS: $9.10 ph, $3.26 mf

Abbreviated versions of technical reports dealing with current work on model atmospheres are presented. Reports included are: (1) A History of Standard and Model Atmospheres, (2) An Investigation of Some of the Constants Required in the Preparation of Standard Atmospheres, (3) Recent Contributions to the Knowledge of Atmospheric Structure and Composition Obtained from Direct Probing Experiments, (4) Temperature Determination Method for Planetary Atmospheres, (5) Note on Equations for Computing Number-Density Ratios from Temperature Profiles, and (6) A Polynomial Fit to the Defining Points for Mean Molecular Weight in the 1962 U.S. Standard Atmosphere. P.V.E.

N64-11384* Stanford Research Inst., Menlo Park, Calif.
FUNDAMENTAL LIMITATIONS ON PRECIPITATION OBSERVATIONS FROM SATELLITES
A. S. Dennis Rep. from Proc. 10th Weather Radar Conf. Washington, D.C., 22-23 Apr. 1963 p 348-354
(NASA Contract NASr-49(06)
(NASA CR-52848)

Consideration of the mechanics of satellite orbits shows that meteorological satellite radar is not a suitable tool for observations of microscale or mesoscale phenomena, due to the infrequency of successive observations. On the other hand, the most realistic systems proposed to date are not suitable for synoptic-scale observations, as coverage is limited to a 20-mile strip directly beneath the satellite. Because of the variability of precipitation in space and time, data from such a strip cannot be extrapolated to provide significant information on synoptic-scale systems. The usefulness of precipitation data obtained in 500-mile swaths is explored briefly, although obtaining such coverage by radar would require major technological advances beyond present-day techniques. Global coverage at reasonable intervals would still require a multisatellite system. Meteorological satellite radar would prove, at best, a prohibitively expensive means of acquiring information of limited meteorological significance. Author

22 NAVIGATION AND GUIDANCE

Includes autopilots; star tracking; inertial platforms; and air traffic control. *For related information see*: 06 Auxiliary Systems; 08 Communications; 09 Electronics; 10 Facilities, Research and Support; 15 Instrumentation and Photography; 20 Mathematics; and 29 Space Sciences.

N64-10933 International Civil Aviation Organization, Montreal (Canada)
AIRCRAFT ACCIDENT DIGEST NO. 12
1963 381 p
(ICAO Circular 64-AN/58) Avail. from ICAO, Intern. Aviation Bldg., 1080 Univ. St., Montreal 3, P. Q. (Can.): $2.00 (Ann. Subscription)

Reports of fifty aircraft accidents occurring during 1960 in commercial air-transport operations are summarized. Whenever possible, photos and diagrams have been obtained in order to give a clearer, overall picture of the crash area, an idea of the probable flight paths of aircraft, and the location of witnesses to the crash. Included in the report are: (1) aircraft accident statistics, (2) a discussion of the windshear hazard, and (3) a listing of the laws and regulations relating to aircraft accident investigation. R.T.K.

N64-10986 Technische U., Berlin (W. Germany) Inst. für Luftfahrzeugfuehrung und Luftverkehr
THE PROBLEM OF FLIGHT SEQUENCE, PART 2: INVESTIGATIONS CONCERNING THE AIR TRAFFIC FLOW WITHIN THE SHORT-DISTANCE TRAFFIC AREA OF AIRPORTS
Edgar Roessger and Hansjuergen von Villiez Apr. 1962 132 p refs
(Supported by Fed. Min. for Traffic Grant)

The subject matter of the paper represents a comprehensive investigation of the problem of flight sequence, i.e., of the circumstances that arise due to the consecutive turns of airplanes. The object of the investigation is the short-distance traffic area of airports, in this case Frankfurt, because it has the highest traffic density. The analysis of the course of movements is based on more than 4,000 radar screen photographs, on tape recordings of the pertinent radio communications, as well as on the evaluation of all air traffic control strips. On the basis of the analysis, comments have been made regarding the prescribed flight procedures and their execution. The deficiencies observed have been discussed, and suggestions aimed at greater safety have been derived therefrom. Author

N64-11173 Navy Electronics Lab., San Diego, Calif.
ACCURACY OF THE OMEGA NAVIGATION SYSTEM
M. L. Tibbals and D. P. Heritage 2 Oct. 1963 13 p
(NEL-1185 AD4; 22435)

The purpose of the investigation was to measure the phase precision and the fix accuracy attainable with the Omega navigation system. It was found that, with the present experimental system, operating at 10.2 kc, long-term root-mean-square timing errors are about 4.5 and 11.5 percent of a carrier period, at day and night, respectively. Root-mean-square fix errors are expected to be about 0.5 and 1.2 miles, at day and night, respectively. Author

N64-11321 Joint Publications Research Service, Washington, D.C.
SEVERAL PROBLEMS IN NAVIGATION THEORY
V. S. Shebshayevich 2 Dec. 1963 8 p refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 151, no. 6, 1963 p 1295–1298
(JPRS-22089; OTS-63-41260) OTS: $0.50

Two formulas are given to show the connection between increments of geometric coordinates and time increments, which corresponds to the passage of the signal between the points being compared. From this relationship, it is possible to find spatial coordinates by known time coordinates, and to find time coordinates by known spatial coordinates. J.E.T.

N64-11405 Marchand Electronic Labs., Greenwich, Conn.
STUDIES IN SELECTED SUBJECTS IN NAVIGATION AND DATA ACQUISITION FOR AIR TRAFFIC CONTROL Condensed Final Report, 25 Aug. 1958–25 Mar. 1963
Nathan Marchand Atlantic City, N.J., Fed. Aviation Agency, Mar. 1963 167 p
(Contract FAA/BRD-26)

The common concern in most of these sections is error behavior. The first nine sections are on the subject of Navigation for Air Traffic Control including a number of mathematical models for the determination of error distribution in navigation systems. Sections ten to fifteen are on the subject of Data Acquisition for Air Traffic Control and include a number of error distribution equations for data acquisition systems. Author

N64-11412 Lockheed-California Co., Burbank
SPACECRAFT GUIDANCE CONTROL AND RELATED TOPICS: A BIBLIOGRAPHY OF THE OPEN LITERATURE, JANUARY 1962–JUNE 1963
R. R. Scranton and A. A. Beltran, comp. Aug. 1963 69 p refs (LR-17100)

The recent literature on navigation, guidance control, and reentry of spacecraft is presented in this unannotated bibliography. Emphasis has been placed on rendezvous, docking, energy management, and manual control. Author

23 PHYSICS, GENERAL

Includes acoustics; cyrogenics; and optics. *For astrophysics see*: 05 Astronomy and Astrophysics. *For related information see*: 12 Geophysics; 29 Space Sciences; 24 Physics, Plasma; and 25 Physics, Solid-State.

N64-10677 Joint Publications Research Service, Washington, D.C.
MEASUREMENT OF THE SURFACE TENSION OF CERTAIN SOLIDS AND LIQUIDS
4 Feb. 1963 87 p refs Transl. into ENGLISH of two articles from Tr. Seminara po Zharostoikim Materialam, Akad. Nauk Ukr. SSR, Inst. Metallokeram. i Spets. Splavov (Kiev), no. 4, 1959 p 5–37; 65–71
(JPRS-17447; OTS-63-21046) OTS: $2.25

CONTENTS:

1. THE THEORETICAL CALCULATION OF THE SURFACE TENSION AND CERTAIN OTHER CHARACTERISTICS OF SOLIDS AND LIQUIDS M. Yu. Bal'shin p 1–70 refs (See N64-10678 02-23)

2. THE SESSILE-DROP METHOD OF MEASURING THE SURFACE TENSION OF METALS OF THE IRON FAMILY V. N. Yeremenko, V. I. Nizhenko, and Yu. N. Ivashchenko p 71–84 refs (See N64-10679 02-23)

N64-10678 Joint Publications Research Service, Washington, D.C.
THE THEORETICAL CALCULATION OF THE SURFACE TENSION AND CERTAIN OTHER CHARACTERISTICS OF SOLIDS AND LIQUIDS
M. Yu. Bal'shin *In its* Meas. of the Surface Tension of Certain Solids and Liquids 4 Feb. 1963 p 1–70 refs (See N64-10677 02-23)

The criteria that allow a differentiation between solid and liquid states are discussed. Some of the conclusions are: (1) the difference between the completely liquid and the incompletely solid states is that in the liquid state the bond energy obstructing deformation of the body can be balanced by the thermal energy in all the atoms of the body; (2) there are two mechanisms for deformation of liquids and solids—breaking-closing of bonds and the slip of atomic boundary layers; (3) knowing the criteria of demarcation of the completely liquid state, the values of the surface tension and the corresponding single-bond energy can be calculated; (4) the orientation of the rupture surface is determined by the criterion of the liquid state, and by the number of bonds, K_0; (5) the Meyer hardness equals the deformation stress and the specific work of deformation; (6) in liquids, there is a difference between the temperature of the individual bonds, explaining the high mobility. D.E.R.

N64-10679 Joint Publications Research Service, Washington, D.C.
THE SESSILE-DROP METHOD OF MEASURING THE SURFACE TENSION OF METALS OF THE IRON FAMILY
V. N. Yeremenko, V. I. Nizhenko, and Yu. N. Ivashchenko *In its* Meas. of the Surface Tension of Certain Solids and Liquids 4 Feb. 1963 p 71–84 refs (See N64-10677 02-23)

Equipment for measuring the surface tension of liquid metals in a vacuum or protective atmospheres by the sessile-drop method using high-frequency heating to 1750 degrees has been designed. The surface tension of aluminum in a vacuum and in a helium atmosphere was determined. The margin of error has been found to be ±5%, with the high-frequency field not affecting the surface tension of the metals. Finally, the surface tension of iron-like metals was determined by the above method, including nickel, cobalt, and iron. D.E.R.

N64-10680 Joint Publications Research Service, Washington, D.C.
AN EQUATION OF DISLOCATION MOTION
A. M. Kosevich 5 Feb. 1963 44 p refs Transl. into ENGLISH of an article from Zh. Eksperim. i Teor. Fiz. (Moscow), v. 43, no. 2, Aug. 1962 p 637–648
(JPRS-17473; OTS-63-21055) OTS: $1.25

The Lagrange function for an elastic field and system of dislocations is set up. The equation of motion of a dislocation in an external stress field is derived. The concept of an effective dislocation mass is introduced, and the order of magnitude of the mass per unit length of a dislocation loop is estimated. Author

N64-10691 Joint Publications Research Service, Washington, D.C.
TWO SOVIET ARTICLES ON RADIATING FIN PROFILES
6 Feb. 1963 21 p refs Transl. into ENGLISH of two articles from Izv. Akad. Nauk SSSR, Otd. Tekhn. Nauk: Energ. i Avtom. (Moscow), no. 6, Nov.–Dec. 1962 p 39–49
(JPRS-17512; OTS-63-21069) OTS: $0.50

CONTENTS:

1. OPTIMUM FORM FOR RADIATION-COOLED FINS G. L. Grodzovskiy p 1-11 refs (See N64-10692 02-23)
2. OPTIMUM FORM FOR HEAT-CONDUCTING FINS TAKING MUTUAL IRRADIATION INTO ACCOUNT V. V. Frolov p 12-18 refs (See N64-10693 02-23)

N64-10692 Joint Publications Research Service, Washington, D.C.

OPTIMUM FORM FOR RADIATION-COOLED HEAT-CONDUCTING FINS

G. L. Grodzovskiy *In its* Two Soviet Articles on Radiating Fin Profiles 6 Feb. 1963 p 1-11 refs (See N64-10691 02-23)

Consideration is given to the problem of the optimum contour of the cross section of a heat-conducting fin of minimum weight, during unilateral delivery of heat to the fin, on the base of the fin. A thin fin with a sloping contour is examined, and a form is given for which the equation of heat transfer along the fin and the law of thermal radiation are valid. C.L.W.

N64-10693 Joint Publications Research Service, Washington, D.C.

OPTIMUM FORM FOR HEAT-CONDUCTING FINS TAKING MUTUAL IRRADIATION INTO ACCOUNT

V. V. Frolov *In its* Two Soviet Articles on Radiating Fin Profiles 6 Feb. 1963 p 12-18 refs (See N64-10691 02-23)

Mutual irradiation of heat-conducting fins is considered and leads to the problem of the optimum quantity of n fins and their optimum form. A plane problem of the optimum contour of fins cooling a polyhedral prism that has a temperature of T_0, taking into account the mutual irradiation of the cooling fins and the faces of the prism, is examined. Thin fins with a sloping contour are examined, and a form is given for which the law of thermal radiation and the equation of thermal conductivity along the fin are valid. C.L.W.

N64-10700 Joint Publications Research Service, Washington, D.C.

DETERMINATION OF ACCELERATION OF GRAVITY WITH GAL GRAVIMETERS FROM A SUBMARINE

12 Feb. 1963 33 p refs Transl. into ENGLISH of an article from Tr. Inst. Fiz. Zemli, Akad. Nauk SSSR (Moscow), no. 24 (191), 1962 p 86-115
(JPRS-17587; OTS-63-21108)

The error of reading (the error involved in processing a recording from a marine gravimeter [GAL]) and methods of processing a recording within specified limits of error are discussed. Tests were conducted on GAL recordings made under various conditions in a submarine. Conclusions reached as a result of the tests are: (1) the following standard deviations characterize the error of experimental determinations with GAL gravimeters in submarines—(a) anomalies in Fay reductions, ±3 to ±4 mgal per point, (b) anomalies in Bouget reductions, ±4 to ±5 mgal per point, or ±10 to ±15 mgal in regions of great depth; (2) the accuracy is limited by (a) errors from neglect of currents (up to 4 mgal), (b) errors in latitude determination (4 to 5 mgal), and (c) errors in measurement of the depth of the sea at the point of observation (up to 10 to 15 mgal for large depths); and (3) a set of five to eight GAL gravimeters enables one to cover a range of variation from 1500 to 2000 mgal without return to the initial point for three or four months. P.V.E.

N64-10701 Joint Publications Research Service, Washington, D.C.

EXPERIMENTAL DETERMINATION OF RADIATION FROM THE EARTH

A. V. Liventsov, M. N. Markov, Ya. I. Merson, and M. R. Shamilev 12 Feb. 1963 10 p refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR, Geofiz. (Moscow), v. 146, no. 2, 1962 p 344-346
(JPRS-17588; OTS-63-21109) OTS: $0.50

The results of rocket measurement of the earth's radiation are presented in tabular form. A comparison is made with results of other investigations, and the conclusion is drawn that rocket measurement of infrared radiation in the 2.5μ to 40μ region is feasible. J.E.T.

N64-10725 Joint Publications Research Service, Washington, D.C.

DIELECTRIC STUDIES ON MOLECULAR INTERACTIONS OF TWO-COMPONENT LIQUID SYSTEMS

Jozef Hurwic (Warsaw Polytech. Inst.) 27 Feb. 1963 14 p refs Transl. into ENGLISH from Compt. Rend. Seances Acad. Polon. Sci., Centre Sci. Paris (France), no. 23, 1961 16 p
(JPRS-17841; OTS-63-21217) OTS: $0.50

The dependence of the dielectric constant and the dielectric polarization on the concentration in mixtures of two organic liquids was studied for different mixtures and temperatures. The relations found are compared with those existing between vapor tension and concentration. Results indicate: (1) for all known binary-liquid systems possessing positive deviations from Raoult's Law, the deviations of the additive dielectric constant are negative; (2) for a system having negative deviations from Raoult's Law, there may be cases where the deviations of the additive dielectric constant are positive; and (3) for all known mixtures of a polar and a nonpolar component, the deviations of the total molecular polarization and orientational molecular polarization of additivity are positive, regardless of the sign of the deviation from Raoult's Law. The relations for vapor tension and density were found to be complex. R.T.K.

N64-10737 Joint Publications Research Service, Washington, D.C.

CRYSTALLOGRAPHY AND TECHNOLOGY

L. Belyayev 7 Mar. 1963 10 p refs Transl. into ENGLISH of an article from Vechernyaya Moskva (Moscow), Jan. 19, 1963 p 2
(JPRS 18012; OTS 63-21275) OTS: $0.50

The development of the science of crystals and its relationship to technology are discussed. The properties of crystal that make them valuable in the development of radio engineering, electronics, and semiconductor technology are enumerated. A discussion is presented of the growth of artificial crystals and the methods of manufacturing many crystalline materials. R.T.K.

N64-10765 Joint Publications Research Service, Washington, D.C.

THE CALIBRATION OF INFRASONIC HYDROPHONES BY THE NULL METHOD

A. N. Golenkov 29 Mar. 1963 19 p refs Transl. into ENGLISH from Issled. v Obl. Akust. i Gidroaskust. Ismereny (Moscow), no. 61 (121), 1962 p 47-57
(JPRS-18422; OTS-63-21457) OTS: $0.50

A model installation is described for the calibration of infrasonic hydrophones by an electromagnetic-balancing method. The sound pressure existing in a chamber is determined after balancing of the pressure by an external electrodynamic force. The necessity for the determination of the acoustic impedance is eliminated, permitting simplification of the calibration procedure. Static calibration of the balancing transformer was accomplished. The sensitivity of the balancing circuit was determined, and an evaluation was made of the accuracy of the calibration method. R.T.K.

N64-10771 Joint Publications Research Service, Washington, D.C.
THE BETATRON AT THE INSTITUTE OF ATOMIC PHYSICS OF THE RUMANIAN ACADEMY OF SCIENCES
C. Iliescu (Inst. of Atomic Physics) 2 Apr. 1963 5 p Transl. into ENGLISH from Tehnica Noua (Bucharest), v. 9, no. 52, 26 Dec. 1962 p 1–3
(JPRS-18505; OTS-63-21483) OTS: $0.50

The maximum energy of the Roentgen radiation obtained from the collision of the electrons in the betatron with a heavy metal target is 25 Mev, and the intensity measured at a distance of 1 meter from the target is 42 Roentgen per minute. Research carried out with the betatron concerns the study of photonuclear reactions which furnish important information on the structure of the nucleus and the production of radioactive isotopes for studies in nuclear spectroscopy. P.V.E.

N64-10857 Aerojet-General Nucleonics, San Ramon, Calif.
ARMY GAS-COOLED REACTOR SYSTEMS PROGRAM: ML-1 SHIELDING DESIGN REPORT
Oct. 1963 163 p refs
(Contract AT(10-1)-880)
(IDO-28609) OTS: $2.75

The shielding was designed to comply with the ML-1 performance specifications which stipulated that the biological shield should attenuate the radiation to certain specified levels within 24 hours after the reactor was shut down from full power operation. Additional shielding was to be provided, as possible within the size and weight limitations, to reduce levels associated with reactor operation. Preliminary designs, final design, analysis, and experiments which resulted in the final design for the ML-1 shield, as well as preliminary evaluations of shield performance, are described. Author

N64-10858 Lehigh U., Bethlehem, Pa.
FOUR-DIMENSIONAL FORMULATIONS OF NEWTONIAN MECHANICS AND THEIR RELATION TO THE SPECIAL AND THE GENERAL THEORY OF RELATIVITY
Peter Havas [1962] 81 p refs
(Partially supported by the NSF)

The following topics are discussed: (1) affine and metric spaces, (2) fundamental properties of the Galilei and Lorentz groups, (3) generally covariant formulation of Newtonian and special relativistic mechanics in flat space, and (4) Newton's theory of gravitation and general relativity. R.T.K.

N64-10859 Gt. Brit. Ministry of Aviation, London Technical Information and Library Services
MEASUREMENTS IN THE LONG WAVE INFRARED SPECTRUM OF THE QUARTZ MERCURY LAMP [MESSUNGEN IM LANGWELLIGEN ULTRAROTSPEKTRUM DER QUARZQUECKSILBERLAMPE]
B. Koch Oct. 1963 19 p refs Transl. into ENGLISH from Ann. Phys (Leipzig), v. 33, 1938 p 335–358
(TIL/T.5375)

Measurements were made on mercury-vapor lamps of various construction and with the use of laminar gratings. These measurements gave a general survey of the most suitable model to be employed for the measurement of the long-wave spectrum of the mercury vapor. There is general agreement between the long-wave spectra of high-pressure lamps of similar outside dimensions but with different working conditions. The spectrum could be followed up to wavelengths of 0.5 cm. The transparency of fused quartz and lithium fluoride were also measured up to wavelengths of 450 and 360 microns, respectively. In addition, the absorption of the long-wave radiation in a second mercury lamp was investigated. The finding of strong absorption in excited mercury vapor agrees with the results of other studies. An evaluation of the blackbody temperature of the radiation and the absolute radiation output is given as are the observations of the locality of the origin in the discharge. J.E.T.

N64-10861 Atomic Energy of Canada Ltd., Chalk River, Ontario
INVESTIGATION OF ThO_2-UO_2 AS A NUCLEAR FUEL
S. V. K. Rao July 1963 49 p refs
(CRFD-1154; AECL-1785)

To evaluate the potential of ThO_2–UO_2 as a nuclear fuel, specimens with UO_2 content from 2.7 to 19 wt % were irradiated in the hydraulic rabbit of the NRX Reactor. In these three-minute irradiations, the power output to produce central melting in the ThO_2–UO_2 sinters decreased as the UO_2 content increased from 5.4 to 19 wt%. The decrease was partly due to an associated increase in porosity with increasing UO_2 content in these particular specimens, but there was also a decrease in the thermal conductivity of the solid itself. The diametral and longitudinal expansions of the sheath were very similar to those previously observed with pure UO_2. No difference in expansion behavior between various compositions was observed when allowance was made for the difference in thermal conductivity already deduced. Air-fired sinters exhibited more grain growth than comparable hydrogen-fired ones, but the sheath expansions were not significantly different. Author

N64-10912* Lincoln Lab., Mass. Inst. of Tech., Lexington
OXYGEN EMISSION AND ABSORPTION
M. L. Meeks *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 18-36 refs (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

The spectrum of oxygen wavelengths shorter than 1 mm are presented. The attenuation per unit-length (db/km) is calculated for three different heights above the earth's surface. The attenuation varies from nearly zero to about 16 db/km for surface conditions. Oxygen lines blend with one continuous region of absorption that stretches from about 52 to 67 Gc. Higher in the atmosphere, the lines show less pressure broadening and begin to separate. The middle peaks reflect single lines or groups of lines in the oxygen spectrum. The solid "spikes" at the bottom of the spectrum curve represent the oxygen spectrum at 30-km elevation. I.v.L.

N64-10963* Aeronautical Systems Div., Wright-Patterson AFB, Ohio
PRESENT AND FUTURE REQUIREMENTS FOR HIGH-TEMPERATURE MEASUREMENTS
Hyman Marcus *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 443–444 (See N64-10937 02-01) GPO: $3.50

New technological problems in temperature measurement, designating precise measurement equipment, and providing natural and simulated environments for studying the behavior of materials at very high temperatures, are investigated. Development of new refractory-metal thermocouples accurate to 2300° K is reported, and effort is being made in perfection of high-temperature techniques to achieve greater accuracy and reproducibility of data. Of particular interest is the determination of thermal-radiation properties of solids at temperatures above 1400° K. E.W.

N64-10987 Babcock and Wilcox Co., Lynchburg, Va.
SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM. MEASUREMENT AND ANALYSIS OF UNIFORM LATTICES OF SLIGHTLY ENRICHED UO_2 MODERATED BY D_2O-H_2O MIXTURES
T. C. Engelder, R. H. Clark, M. N. Baldwin, E. J. De Roche, G. T. Fairburn et al Nov. 1963 151 p refs
(Contract AT(30-1)-2602)
(BAW-1273; Ca-7) OTS: $2.75

This report summarizes the experimental results and theoretical interpretation of a series of twenty uniform-lattice critical experiments in which the neutron spectrum is varied over a fairly broad range. Two types of fuel rods were studied: 4.02%-enriched UO_2 in stainless steel tubes and 2.46%-enriched UO_2 in aluminum tubes. Lattice nonmoderator-to-moderator volume ratios ranged from 0.65 to 1.2. The moderators were mixtures of light and heavy water ranging in composition from zero to 77% D_2O, with and without boric acid. Measurements include critical size and composition, $\delta p/\delta h$, buckling and reflector savings, thermal disadvantage factor, and cadmium ratios of U^{235} and U^{238}. Theoretical methods used to analyze the data are given, and results are compared. Author

N64-11000 Laboratoire de Physique Theorique et des Hautes Energies (France)
POSSIBLE UNITARY SYMMETRY PROPERTIES OF THE INTERMEDIATE BOSONS AND THEIR INTERACTIONS
B. d'Espagnat [1963] 5 p refs

On the assumption that the bulk of the strong interactions is invariant under the group U_3 (unitary symmetry) and that the weak interactions are mediated by weakly coupled vector mesons, the question of whether or not the weak interactions and their intermediate bosons deal with the group U_3 is raised. Mathematical expressions proving that the weak interactions and the U_3 group are related are derived and proved. The proof is general in nature and does not depend on the value of the boson (w). The theory does not contain neutral leptonic currents, however, but the nonleptonic rule emerges naturally. The theory does lend a kind of symmetry between the properties of the different types of interactions—strong, electromagnetic, and weak. D.E.R.

N64-11003 Joint Publications Research Service, Washington, D.C.
OBTAINING A SUPER-HIGH VACUUM BY MEANS OF OXIDE ELECTRONIC SEMICONDUCTORS PULVERIZED BY ELECTRON BOMBARDMENT
G. S. Mykhaylov, O. M. Akymovych and I. B. Pronina *In its* Electromagnetic Wave Scattering and Super-High Vacuum Via Semiconductors 8 Feb. 1963 p 9–12 refs Transl. into ENGLISH from Vkr. Fiz. Zh. (Kiev), v. 7, no. 12, Dec. 1962 p 1367–1368 (See N64-11001 02-01) OTS: $0.50

The existence of considerable chemical activity of the lower oxides of titanium of the general formula TiO_{1+x}, where x is greater than O and less than 1, leads to consideration of whether it is possible to utilize them to obtain a high or superhigh vacuum by their intense pulverization and condensation by means of electron bombardment. Tests were conducted which indicate a way to obtain superhigh vacuums, i.e., the unsaturated chemical activities of titanium atoms which enter the composition of oxide electronic semiconductors. Moreover, the tests indicate the possibility in principle of synthesis of complex chemical compounds which have rather high gas-absorption properties during pulverization by electron bombardment, with end components, each of which has practically no especially indicated properties. C.L.W.

N64-11070 Joint Publications Research Service, Washington, D.C.
DEVELOPMENT IN HUNGARIAN PHYSICS
4 Jun. 1963 27 p refs Transl. into ENGLISH of two articles from Fiz. Szemle (Budapest), v. 13, no. 3, Mar. 1963 p 71–78; 95–96.

CONTENTS:

1. OPTICAL PUMPING OF GASES Laszlo Csillag p 1–18 refs (See N64-11071 02-23)

2. INTERNATIONAL CONFERENCE ON HIGH ENERGY PHYSICS P 19–24 (See N64-11072 02-23)

N64-11071 Joint Publications Research Service, Washington, D.C.
OPTICAL PUMPING OF GASES
Laszlo Csillag *In its* Develop. in Hung. Phys. 4 Jun. 1963 p 1–18 refs (See N64-11070 02-23) OTS: $0.75

The optical pumping of gases, the method based on the properties of light absorption and emission of Zeeman's magnetic sublevels, is discussed. The concept of optical pumping is dealt with first, followed by its applications. Some of these applications are: the measurement of small energy differentials; measurement of the hyperfine structure of energy levels; measurement of the magnetic momentum of the free electron; measurement of the duration of life and studies of the structure of excited atomic states; and measurements of the strength of the magnetic field and of orientation in the field. C.L.W.

N64-11072 Joint Publications Research Service, Washington, D.C.
INTERNATIONAL CONFERENCE ON HIGH ENERGY PHYSICS *In its* Develop. in Hung. Phys. 4 Jun. 1963 p 19–24 (See N64-11070 02-23) OTS: $0.75

A conference on high energy physics is discussed. The reports were grouped around two subjects: the reciprocal effects of artificially accelerated elementary particles in the Gev range and cosmic radiation. C.L.W.

N64-11094 California U., Livermore. Lawrence Radiation Lab.
ABYSS— A NARROW RESONANCE, EPITHERMAL NEUTRON CAPTURE PROBABILITY CODE FOR INFINITE PLANE LATTICES
G. M. Benson and B. K. Crowley 30 Jun. 1962 54 p refs
(Contract W-7405-eng-48)
(UCRL-7023) OTS: $1.25

ABYSS is a computer program for calculating the neutron absorption probabilities per absorber resonance for the *i*th absorber foil lying in moderator slot d_1 and for the *j*th foil lying in moderator slot d_2. The total probability that a neutron is absorbed in the *i*th of the *j*th foil while slowing down past a given absorber resonance is given by a set of derived equations. R.T.K.

N64-11095 California U., Livermore Lawrence Radiation Lab.
CALCULATION OF ELASTIC-PLASTIC FLOW
Mark L. Wilkins 19 Apr. 1963 66 p refs
(Contract W-7405-eng-48)
(UCRL-7322) OTS: $1.50

An equation of state is developed which is used in the calculation of elastic-plastic flow: it uses simple idealizations of the outstanding features of the real phenomenon. Numerical techniques are considered. The equations of motion are completely independent of any rheological equation of state, and any form may be used. One-dimensional and two-dimensional flow, and the application of each, are considered. The finite difference equations for the equations considered in the text are presented. P.V.E.

N64-11104* Ohio State U. Research Foundation, Columbus
RECEIVER TECHNIQUES AND DETECTORS FOR USE AT MILLIMETER AND SUBMILLIMETER WAVE LENGTHS Annual Summary Report, 1 Mar. 1962-31 Aug. 1963
1 Sep. 1963 13 p refs
(NASA Grant NsG-74-60)
(NASA CR-52685; Rept. 1093-18) OTS: $1.60 ph, $0.80 mf

An investigation was made of the various detection and receiver techniques, both conventional and nonconventional, in the millimeter and submillimeter wavelength regions. A submillimeter radiometer was developed. Also studied were the use of a carbon bolometer as a detector and the measurement of the submillimeter properties of maser crystals. R.T.K.

N64-11109 Philco Corp., Blue Bell, Pa. Scientific Lab.
THEORETICAL AND EXPERIMENTAL INVESTIGATION ON MODULATION INDUCING RETRODIRECTIVE OPTICAL SYSTEMS Monthly Contract Progress Report No. 4, 21 Aug.-21 Sep. 1963
B. W. Harned and M. E. Lasser 26 Sep. 1963 8 p refs
(NASA Contract NASw-721)
(NASA CR-52859) OTS: $1.10 ph, $0.80 mf

Effort was devoted entirely to further exploration of optical pumping. Previous reports that microwave and low radiofrequency signals can disturb optical alignment were confirmed during this period in experimental tests which indicated other means for cross modulation. The suggested use of magnetic fields to alter population was attempted, and it was found that current from a solar cell introduced to a pair of electromagnets was sufficient to produce the desired result. Variations in optical equipment and adjustments provided additonal useful information. Author

N64-11118* Wisconsin U., Madison Theoretical Chemistry Inst.
THE EXACT EXPANSION OF THE ELECTRONIC ENERGY OF ONE-ELECTRON DIATOMIC MOLECULES IN POWERS OF THE INTERNUCLEAR SEPARATION
W. Byers Brown and Erich Steiner 23 Sep. 1963 14 p refs
(NASA Grant NsG-275-62(4180); Contract AF 33(657)-7311)
(NASA CR-52609; WIS-TCI-33) OTS: $1.60 ph, $0.80 mf

The exact expansion of the electronic energy of the ground state of one-electron diatomic molecules through the fourth order in powers of the internuclear separation is derived by using the methods introduced by Hylleraas (1931). It is thereby shown that the straightforward perturbation treatment of the electronic energy of molecules based on the united atom as given by Bingel (1959) leads to incorrect results for the third-order coefficient. The exact fourth-order coefficient is checked by using the Hellmann–Feynman theorem to relate the expansion to the well-known formula for the electrostatic potential due to a hydrogen-like atom. Author

N64-11161 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ELECTRODYNAMIC DAMPER
V. I. Babitskiy and A. Ye. Kobrinskiy 2 Oct. 1963 9 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. i Mashinostr., no. 3, 1962 p 81–84
(FTD-MT-63-28/1+2+3+4; AD-409074)

A new method of dynamic extinguishing is proposed for oscillations, based on the use of an adjustable electromagnetic interaction between a damping system and a vibroextinguished element. Basic calculated ratios are made and frequency characteristics constructed in optimum regulation of the system. Author

N64-11188 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ON THE STABILITY OF MOTION OF A HEAVY POINT OF VARIABLE MASS
A. S. Gallullin 19 Sep. 1963 23 p refs Transl. into ENGLISH from Tr. Kazansk. Aviats. Inst. (Kazan), no. 45, 1959 p 45–62
(FTD-TT-62-1188/1+2; AD-420858)

Certain stability conditions are established for the movement (as a function of time) of a heavy point of variable mass, in a vertical plane, for the case when the active force of the medium is directed along the tangent to the trajectory. R.T.K.

N64-11194* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
ANISOTROPIC EFFECTS IN HELICALLY WOUND SUPERCONDUCTING SOLENOIDS
Edmund E. Callaghan Washington, NASA, Dec. 1963 15 p refs
(NASA TN D-2083) OTS: $0.50

It is shown that hard superconductors, which demonstrate considerable anisotropy, that is, which carry much higher currents parallel to rather than perpendicular to magnetic fields, should be capable of producing greater magnetic fields when wound in a solenoid of 45° pitch angle. Also shown are the effects of pitch angle, current density, and anisotropy on the magnetic field of any helical solenoid of finite length, which can be approximated by a helical current sheet where the length-to-diameter ratio is greater than 2. Author

N64-11202 Florida U., Gainesville Florida Engineering and Industrial Experiment Station
ENGINEERING PROGRESS AT THE UNIVERSITY OF FLORIDA VOL. XVII, NO. 7: STUDIES IN ACTIVATION ANALYSIS
T. F. Parkinson, L. G. Grant, D. E. Solberg and J. A. Wethington, Jr. Repr. from Nature, v. 197, nos. 4866 and 4867, Feb. 1963 9 p refs

The studies in activation analysis include (1) two methods that were used for the quantitative determination of oxygen-18, and (2) the activation analysis of particulate air contaminants. C.L.W.

N64-11209 Hanford Atomic Products Operation, Richland, Wash.
VISIBLE AND INFRARED ABSORPTION SPECTRA OF URANIUM DIOXIDE
J. L. Bates Sep. 1963 14 p refs
(Contract AT(45-1)-1350)
(HW-79033) OTS: $0.50

The absorption spectra for single crystal and polycrystalline UO_2 have been measured between 0.6μ and 15μ at room temperature. The spectrum for UO_2 resembles that of a typical semiconductor, opaque in the visible but transparent

over a large portion of the infrared. The absorption edge is located at approximately 0.6μ (2.0 ev). A large optical window extends from 3μ to 13μ. The absorption coefficient for single crystal UO_2 has been determined between 1.5μ and 15μ. A maximum value of 57 cm^{-1} was measured at 1.70μ with minimum values of 6 cm^{-1} at 2.75μ and 8μ.. The absorption coefficient of polycrystalline UO_2 at wavelengths less than 8μ is estimated to be ten times larger than for single crystal UO_2.
Author

N64-11231* Texas U., Austin
A REMARK ON THE CONFIGURATION INTERACTION APPROACH
Charles W. Scherr and Robert E. Knight [1963] 10 p refs
Submitted for Publication
(NASA Grant NsG-263-62)
(NASA CR-52696) OTS: $1.10 ph, $0.80 mf

The expansion of the helium atom wave functions, as Legendre functions, $P_\ell(\omega)$, of the cosine of the angle between the $\underline{r}_1$ and $\underline{r}_2$ radius vectors, is discussed. Investigations have conflicted on the mechanism of convergence, some concluding that the expansion was a slowly converging series and others that convergence had been rapid. Subsequent reassessments have established beyond question that for the best possible accuracy, the procedure is slowly convergent. Davis obtained E^0 for the 1^1S two-electron isoelectronic series through Z = 20 by a variational procedure. A table is given which presents the E_i^ℓ (where E is the perturbation energy coefficient, i is the order, and ℓ is the quantum number) for i = 0, 1, 2, 3 and ℓ = 0, 1, 2 for the 1^1S, 2^3S, 2^1P, and 2^3P states of the two-electron isoelectronic series, which were obtained through previous calculations on these systems. Calculations have also been extended to obtain E_i^0 through i = 7 for the ground state.
C.L.W.

N64-11243 Bettis Atomic Power Lab., Pittsburgh, Pa.
IRRADIATION BEHAVIOR OF BULK B_4C AND B_4C+SiC BURNABLE POISON PLATES
R. G. Gray and L. R. Lynam Oct. 1963 122 p refs
(Contract AT-11-1-GEN-14)
(WAPD-261) OTS: $2.50

Zircaloy-clad elements of bulk B_4C and B_4C–SiC were irradiated in pressurized hot water loops and in the Materials Testing Reactor (MTR) process water to depletions as high as 97-percent burnup of the boron-10 atoms present. The B_4C showed a linear volume swelling rate of approximately 0.15 percent ΔV per 10^{20} depletions/cc up to about 90×10^{20} depletions/cc after which a more rapid swelling occurred as a result of B_4C cracking. Elements containing B_4C–SiC showed greater thickness changes as a result of SiC cracking. A severe decrease in hot water corrosion resistance occurs during irradiation of the bulk B_4C and B_4C–SiC poison cores, resulting in disintegration of these poison cores when exposed to the water environment in-pile. B_4C plate-type poison elements show greater thickness increases than would be expected from poison core volume swelling because of the formation of poison core-cladding gaps in the elements. The element swelling was extremely sensitive to fabrication variables.
Author

N64-11251 France. Office National d'Etudes et de Recherches Aéronautiques, Chatillon-sous-Bagneux
STANDARDIZATION OF ANALYTICAL FUNCTIONS FOR USE IN PROBLEMS OF MECHANICS [L'UNIFORMISATION DES FONCTIONS ANALYTIQUES POUR LEUR UTILISATION A L'ETUDE DES PROBLEMES DE MECANIQUE]
Robert Legendre [1963] 60 p In FRENCH Presented at the IUTAM Intern. Symp. on Appl. of the Theory of Functions to the Mech. of Continuous Media, Tbilisi (USSR), Sep. 1963
(ONERA-TP-55(1963))

The advantage of standardizing analytical functions is emphasized, and the types of problems concerning the mechanics of the continuous medium are discussed. The principles of resolving these problems are followed as systematically as generality permits. An example of a method of standardizing with automorphic functions is treated, and some applications illustrating the use of analytical methods in solving problems of mechanics are presented.
Trans. by I.v.L.

N64-11281 Babcock and Wilcox Co., Lynchburg, Va. Nuclear Development Center
SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM
T. C. Engelder, N. L. Snidow, D. M. Roberts, G. T. Fairburn, and D. H. Roy Nov. 1963 127 p refs
(AEC Contract AT(30-1)-2602)
(BAW-1283; Ca-7) OTS: $2.50

The Small Lattice Experiment (SLE) is a technique for measuring k_∞ and other infinite-medium lattice parameters using much less test fuel than is required for equivalent critical or exponential experiments. The theoretical basis for applying such an experiment to epithermal lattices is discussed, an analysis of spectral mismatch error is given, and the facility for the measurements is described. SLE measurements are compared to those in an equivalent critical assembly to test the validity of the technique.
Author

N64-11295 Geophysics Corp. of America., Bedford, Mass.
PLANETARY AERONOMY XV: TRANSPORT PROPERTIES AND SCATTERING IN MOLECULAR GASES
A. Dalgarno and R. J. W. Henry Jun. 1963 19 p refs
(NASA Contract NASw-701)
(NASA CR-52875; GCA TR-63-21-N) OTS: $1.10 ph, $0.80 mf

Experimental data on transport properties and scattering in molecular gases are usually interpreted assuming a spherically symmetric interaction potential and single channel (elastic) scattering. This procedure is analyzed and shown to be justifiable as a first approximation provided it is recognized that the generalization of transport theory to molecular gases involves the replacement of elastic cross sections by total cross sections, and that the beam scattering data refer to total cross sections and not elastic cross sections. The distinction between total and elastic cross sections is especially significant for ion–molecule interactions at thermal velocities, since it implies a form for the long-range interaction different from that which has been adopted. Some consequences of this difference in long-range behavior are described. Explicit calculations are presented for the scattering of atomic hydrogen by molecular deuterium.
Author

N64-11296* Space Technology Labs., Inc., Los Angeles, Calif.
PROBLEMS IN SPACE PHYSICS
G. E. Mueller and E. R. Spangler [1963] 32 p refs
(NASA CR-52759) OTS: $3.60 ph, $1.16 mf

Three fundamental problems of space physics are discussed: (1) the mechanics involved in the creation and maintenance of the solar wind, (2) the source of the steady interplanetary magnetic field, and (3) the configuration and dynamics of the geocentric magnetosphere.
R.T.K.

N64-11304 California U., Livermore Lawrence Radiation Lab.
AN IN-REACTOR RADIOMETRIC CALORIMETER
Stuart R. Gunn 11 Sep. 1963 17 p refs
(Contract W-7405-eng-48)
(UCRL-7489) OTS: $0.50

A twin isothermal resistance-bridge calorimeter for use in a pool-type nuclear reactor is described. Measurements of fission energy in U^{235} foils and derivation of the thermal neutron flux are given as examples of its use. Author

N64-11305 California U., Berkeley Lawrence Radiation Lab.
KINETIC ENERGY AND MASS DISTRIBUTIONS FOR NUCLEAR FISSION AT MODERATE EXCITATION ENERGY
Donald S. Burnett 7 Oct. 1963 108 p refs
(Contract W-7405-eng-48)
(UCRL-11006) OTS: $2.25

Fission fragment kinetic energy measurements using semiconductor detectors have been made for the alpha-induced fission of: (a) Au^{197} + 65.0 Mev α, (b) Bi^{209} + 65.0 Mev α, (c) Th^{232} + 21.4, 25.7, 33.0, and 65.0 Mev α, and (d) U^{238} + 25.7, 33.0, and 65.0 Mev α. The data were recorded as the number of events at fragment energies E_1 and E_2, $N(E_1, E_2)$. The data were then transformed into mass–total kinetic energy maps and analyzed by means of moments. The Bi and Au data are in good agreement with quantitative theoretical predictions from the liquid drop model available for the lighter elements. The U and Th data are discussed in terms of qualitative ideas which have been proposed to explain the properties of the fission process for the heavier elements. Author

N64-11311 European Atomic Energy Community, Brussels (Belgium)
PREPARATION AND CALIBRATION OF CO^{60} STANDARDS FOR INTEGRATED THERMAL FLUX MEASUREMENTS
R. Vaninbroukx and G. Grosse Joint Nuclear Research Center, Central Nuclear Measurements Bureau, Geel Establishment (Belgium). Oct. 1963 22 p refs
(EUR 422.e) Available from Belgian American Bank and Trust Co., N.Y., Account No. 121.86: 40 Belg. Fr.

Three series of Co^{60} standards for flux monitoring—0.25, 2, and 35 Mc—were prepared and standardized with high precision. The maximum error on the absolute activity is ±1%. The complete standardization method, including the absolute and the relative method, is described in detail, together with a discussion of the errors. The activities of the standards are expressed also in thermal flux units, and an explanation of this choice of unit is given. Author

N64-11314 Oak Ridge National Lab., Tenn.
A PROPOSAL FOR THE Mc^2 ISOCHRONOUS CYCLOTRON – A GENERAL PURPOSE HIGH-INTENSITY 810-MeV PROTON ACCELERATOR
1 Nov. 1963 317 p refs
(Contract W-7405-eng-26)
(ORNL-3540) OTS: $4.00

The building of an isochronous eight-sector proton cyclotron is proposed to provide an extracted beam in excess of 100 µA at 810 Mev. The primary proton beam and the secondary meson and neutron beams will be used to investigate nuclear structure, and the interactions between elementary particles. Biomedical and space-oriented research programs are also planned. Shielded research areas and an extensive beam transport and analysis system are provided. Theoretical and experimental studies have shown that the Mc^2 cyclotron is a practical concept; high extraction efficiencies can be obtained, and the residual radiation problems are manageable. The project would require less than seven years to complete, and would cost about $43,000,000. Author

N64-11315 Joint Publications Research Service, Washington, D.C.
CONTROL OF NOISE AND SONIC VIBRATION IN SHIPS
Igor' Ivanovich Klyukin 13 Sep. 1963 419 p 173 refs Transl. into ENGLISH of book "Bor'ba s shumom i zvukovoy vibratsiyey na sudakh" Leningrad, Publ. House of Shipbuilding Lit. (Sudpromgiz) 1961 355 p
(JPRS-18177; OTS-63-21340) OTS: $6.00

This book discusses the sources of noise in ships and explains the bases for controlling noise and vibration in ships. A short treatment of the fields of physical, physiological and structural acoustics, as well as acoustical measurements, is presented. Modern methods of sound and vibration insulation, and sound and vibration absorption, and methods for measuring these values are described. The causes of the origin of vibrations in machinery and mechanisms are analyzed, and several means and methods for controlling these vibrations are indicated. Author

N64-11341 Bettis Atomic Power Lab., Pittsburgh, Pa.
BETTIS TECHNICAL REVIEW: REACTOR TECHNOLOGY, OCTOBER 1963
S. G. Margolis et al [1963] 91 p refs
(Contract AT(11-1)-GEN-14)
(WAPD-BT-29) OTS: $2.00

The following reports are included: (1) operator-induced Xenon oscillation; (2) SAFE-1—a computer program for nuclear safety criticality calculations; (3) the fabrication of PWR (pressurized water reactor) core two-seed fuel wafer; (4) the detection of alpha-active contamination and heterogeneity in UO_2 and UO_2-solid solutions by autoradiograph; (5) measuring power distributions in PWR; (6) matrix conditioning for alternating direction methods; and (7) some comments on three-dimensional alternating direction methods. R.T.K.

N64-11343 Rochester U., N.Y.
UNIVERSAL THEORY OF SEMI-WEAK INTERACTIONS
R. E. Marshak, C. Ryan, T. K. Radha (Stanford U.), and K. Raman (Inst. for Mathematical Sci., Madras) 21 Oct. 1963 43 p refs Submitted for Publication
(Contract AT(30-1)-875)
(URPA-14)

The universal theory of semiweak interactions is proposed on the basis of new baryon-lepton symmetry principle and the conservation of a new quantum number X—the "weak hypercharge". The universality of the theory is achieved by coupling two intermediate charged-vector bosons of different mass and X to the strangeness-conserving and strangeness-changing currents. Acceptance of the conserved vector current hypothesis for strangeness-conserving processes leads to definite statements concerning the fields describing the electron and muon neutrinos, the $(\Delta Q/\Delta S)$ properties of the strangeness-changing current, and the existence of neutrino flip. The more striking experimental predictions of the theory (e.g. neutrino flip accompanied by hyperon production) are discussed in some detail. Author

N64-11380 Texas U., Austin
ISOTOPE SHIFTS IN 2^1P AND 2^3P STATES OF He AND Li^+
Milos Machacek and Charles W. Scherr [1963] 5 p refs Submitted for Publication
(NASA Grant NsG-263-62)
(NASA CR-52694) OTS: $1.10 ph, $0.80 mf

The experimental results of the measurement of the energy values and isotope shifts of the 2^1P and 2^3P levels of He^3, He^4, $(Li^+)^6$, and $(Li^+)^7$ are presented in tabular form. The discrepancy between theory and experiment has now been brought within the limits of experimental accuracy. On the basis of the agreement for helium, it is believed that the calculated results for Li^+ are accurate to within one percent.
J.E.T.

N64-11388 College of Aeronautics, Cranfield (Gt. Brit.)
THE FREE-MOLECULE FLOW CHARACTERISTICS OF CONCAVE SURFACES
M. J. Pratt Jun. 1963 40 p refs
(CoA. Note 155)

General equations are formulated for the lift, drag, and heat-transfer characteristics of concave surfaces. The effect of multiple reflections is taken into account by use of the Clausing integral equation to determine the redistribution of molecular flux over the surface. It is assumed that emission of molecules from the surface is purely diffuse, and that the reflected molecules are perfectly accommodated to the surface conditions. The equations obtained are solved for the cases of (1) an infinitely long circular cylindrical arc and (2) a section of a spherical surface, at hyperthermal velocities. It is found that, under the above conditions, the local heat-transfer characteristics are the same as those of the corresponding convex surface, the total heat transfer being independent of the geometry of the surface. As drag devices, the concave surfaces examined prove only slightly more effective than a flat plate at similar incidence, and, as a generator of lift, the cylindrically cambered plate is significantly inferior to the flat plate at similar incidence.
Author

N64-11390 Argonne National Lab., Ill.
A SURVEY OF PROMPT-NEUTRON LIFETIMES IN FAST CRITICAL SYSTEMS
G. S. Brunson, R. N. Curran, J. M. Gasidlo, and R. J. Huber Aug. 1963 68 p refs
(Contract W-31-109-ENG-38)
(ANL-6681)

Measurements of prompt-neutron lifetime by the Rossi-α method in more than 30 different critical systems are reported. Most were assembled in Argonne's Zero Power Reactor III (ZPR-III). The Rossi-α method represents a direct experimental determination of the ratio $\Delta k_p/\tau_o$, from which a value for τ_o is obtained if an estimate of Δk_p is available. Results indicate that for these assemblies, the lifetime is almost entirely governed by the uranium content of the core, and results on lifetime have been related to an empirical parameter:

$$V^* = \left(\frac{\text{Core Volume}}{\text{Fraction of } U^{235}}\right) + \frac{1}{9}\left(\frac{\text{Core Volume}}{\text{Fraction of } U^{238}}\right)$$

For values of V^* greater than 0.09, τ_o(in shakes) $\cong 1.35\ (V^*)^{-0.85}$ (1 shake = 10^{-8} sec) has been obtained for all-metal assemblies. For values of V^* less than 0.10 the empirical relationship is τ_o(in shakes) $\cong 0.37\ (V^*)^{-1.48}$.
Author

N64-11398 Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia)
ANISOTROPY OF DIFFUSION CONSTANT IN MEDIA WITH EMPTY CHANNELS
M. Copic, T. Kalin, G. Pregl, and F. Zerdin May 1963 13 p refs
(NIJS-R-413)

The thermal neutron diffusion constant was measured in a Plexiglas system with empty channels, using the pulsed-neutron-source technique. From separate sets of measurements on rectangular blocks, the diffusion constants parallel and perpendicular to channels were determined, whereas the measurements on cubes give the average diffusion constant. The results are compared with exising theoretical estimations. It is found that the average diffusion constant is well below the theoretical predictions of Behrens. On the other hand, the difference between the parallel and the perpendicular diffusion constant is larger than predicted theoretically.
Author

N64-11401 Atomic Energy Commission, Washington, D.C. Div. of Technical Information
RADIOACTIVE ISOTOPES AND THE CONSTRUCTION INDUSTRY, INTERNATIONAL COLLOQUIUM, LEIPZIG, SEPTEMBER 28-30, 1963 [RADIOAKTIVE ISTOPE UND DCS BHUWESEN, INTERNATIONALES KOLLOQUIUM, SEPTEMBER 28-30, 1960]
E. Steiger et al May 1963 326 p refs Transl. into ENGLISH by Joint Publ. Res. Serv., N.Y. from Wiss. Z. Hochsch. Bauwesen, Leipzig, Sonderdruck, 1960 p 1–152
(AEC-tr-5632) OTS: $4.00

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N64-11402 Laboratoire d'Infrarouge Technique et Appliqué, Gif-Sur-Yvette (France)

STUDY OF THE EDGE EMISSION OF CADMIUM SULPHIDE BOMBARDED BY ELECTRONS Final Report, 1 Oct. 1962–30 Sep. 1963

[1963] 22 p

This is an investigation of the luminosity emitted when cadmium sulphide (and silicon), cooled to liquid helium temperature, is bombarded with electrons. General conclusions are that: (1) if the minimum emission of the conduction band is situated in the middle of the Brillouin zone, only vertical transition (phonon emission or absorption) is observed; (2) if the energy level at the center of the zone rises a little above the minimum, vertical and oblique (no phonon emission) transitions appear simultaneously, the ratio between the intensities of the corresponding radiations decreasing when the energy level difference increases; for large differences the central transition becomes negligible; and (3) the results, compared with those to be found in the literature, tend to disprove a too widespread opinion that cathodoluminescence, like electroluminescence, radioluminescence, etc., is a specific phenomenon. P.V.E.

24 PHYSICS, PLASMA

Includes fusion; and magnetohydrodynamics. *For related information see*: 05 Astronomy and Astrophysics; 23 Physics, General; and 25 Physics, Solid-State.

N64-10821 Joint Publications Research Service, Washington, D.C.

EFFECTS AT THE CATHODE OF A PLASMA DIODE AS A MODEL OF MAGNETOGAS DYNAMIC ENERGY CONVERSION

N. D. Morgulis 27 May 1963 8 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), no. 10, 1962 p 1131–1134

(JPRS-19408; OTS-63-21917) OTS: $0.50

Discussed is the study of current passage through a diode system having its cathode heated to various temperatures and its interelectrode space filled with an independently created plasma. The investigation was carried out on an approximate model of a magnetogasdynamic (MGD) conductive converter consisting of a system of plane-parallel thermionic diodes introduced into an independently created gas discharge plasma. P.V.E.

N64-11116* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

REPLY TO COMMENTS BY BURT, KLEVANS, AND WU

James F. Morris Repr. from Phys. Fluids, v. 6, no. 9, Sep. 1963 1 p

(NASA RP-84)

The comment by Burt, Klevans, and Wu (BKW) on the note of the author in The Physics of Fluids 5, 1480 (1962) contains a modification of the plasma-dispersion expression that can be found of value if properly qualified. BKW added a term that is necessary only when the exchange effect is important. This in no way contradicts the results presented by the author for the damping of quantized longitudinal electron oscillations in a nondegenerate plasma. The relations given by the author were derived directly from the random phase approximation for temperatures higher than the degeneracy value. Obviously, BKW do not wish to imply that exchange is a dominating factor above the degeneracy temperature, where electrons behave as a classical gas. Although the criticisms of BKW do not apply for the conditions used by the author, the extension of the theory is gratifying; it will add to the understanding of the damping mechanism for longitudinal electron oscillations in plasmas where exchange effects must be considered. I.v.L.

N64-11248 Nagoya U., (Japan) Inst. of Plasma Physics

PROPAGATION OF HYDROMAGNETIC WAVES IN A COLLISIONLESS PLASMA

Kyusuke Kato and Tosiya Taniuti (Kobe U.) May 1963 24 p refs

(IPPJ-11)

A collisionless plasma is treated as a hydrodynamic system in the Chew–Goldberger–Low approximation. The dispersion relation for weak, plane disturbances in a uniform plasma is derived. Fast and slow magnetoacoustic waves and the Alfvén wave are found to exist, as well as two degenerate waves which propagate with fluid velocity. The condition is given that the system is totally hyperbolic. The configuration where the system is partially elliptic is investigated in detail, especially for the slow wave. Author

N64-11249 Nagoya U. (Japan) Inst. of Plasma Physics
RESONANCE PROBE IN A MAGNETIC FIELD
J. Uramoto, H. Ikegami and K. Takayama Oct. 1963 14 p refs
(IPPJ-15)

Electron cyclotron resonance is observed by the resonance probe applied to a plasma in a magnetic field. The resonance appears only when the magnetic field is perpendicular to the RF electric field, that is, parallel to the surface of the plane probe in this case, and only when the cyclotron frequency exceeds the electron plasma frequency, henceforth called ordinary resonance. The ordinary resonance seems to disappear when the cyclotron resonance is observed. As the magnetic field intensity is increased, the ordinary resonance peak is changed into the cyclotron resonance, and its frequency begins to increase proportionally to the magnetic field intensity. Its behavior depends also on both the background pressure and the probe potential. Experimentally, it is confirmed that at the cyclotron frequency electrons are heated up by the RF electric field. No heating is observed at the ordinary resonance frequency. Author

N64-11255* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
MAGNETO-FLUID DYNAMIC TURBULENCE WITH A UNIFORM IMPOSED MAGNETIC FIELD
Robert G. Deissler Repr. from Phys. Fluids, v. 6, no. 9, Sep. 1963 p 1250–1259 refs
(NASA RP-86)

Two-point correlation and spectral equations for this case are derived from the equations of fluid dynamics and electrodynamics. Solutions are obtained by assuming that the turbulent field is homogeneous and weak enough for triple correlations to be negligible. For initial conditions, it is postulated that the turbulence is initially isotropic, and that the turbulent magnetic field fluctuations are initially zero. The interaction of the mean magnetic field with the turbulent velocity field then causes magnetic field fluctuations to arise at later times. In general, the turbulent energy in the mechanical and magnetic modes tends toward equipartition for large values of time or of mean magnetic field. However, when the kinematic viscosity is much less than the electrical resistivity (or magnetic diffusivity), as for liquid metals, equipartition is not approached before the turbulence is damped out by the mean magnetic field. Author

N64-11279 Princeton U., N.J. Plasma Physics Lab.
FREQUENCY AND WAVELENGTH DEPENDENT ELECTRICAL TRANSPORT EQUATION FOR A PLASMA MODEL
Herbert L. Berk Aug. 1963 23 p refs
(Contract AT(30-1)-1238)
(MATT-216)

The plasma model used by Dawson and Oberman is extended to the collision frequency and to finite wavelengths. To the so-called dominant order, the collisional term is a Fokker–Planck equation which is frequency dependent. At low frequencies, the electrical conductivity is found to agree with conventional Lorentz-gas theories, while at high frequencies, the electrical conductivity is that predicted by Oberman and Dawson. The finite wavelength corrections to the electrical conductivity are obtained. Author

N64-11313 Princeton U., N.J. Plasma Physics Lab.
THERMAL RELAXATION IN A ONE-SPECIES, ONE-DIMENSIONAL PLASMA
John M. Dawson Jul. 1963 26 p
(Contract AT(30-1)-1238)
(MATT-213)

Kinetic theories for a one-species, one-dimensional plasma, that take into account only two-particle correlations, predict all stable distributions are time independent and have no relaxation to a Maxwellian. This is investigated by numerical experiments on a one-dimensional plasma model where the initial distribution was square. The theory is verified in that it is found that the relaxation time goes as line $n_D{}^2$ and appears to be caused by three-particle correlations. In addition to the slow relaxation, an initial transient was found which lasted for a time of the order of $1/\omega_p$ and which is accounted for by an elementary theory. Author

N64-11327* Avco-Everett Research Lab., Everett, Mass.
INTERACTION OF A STREAMING PLASMA WITH THE MAGNETIC FIELD OF A TWO-DIMENSIONAL DIPOLE
R. H. Levy Aug. 1963 16 p refs
(NASA Contract NASw-748)
(NASA CR-52867; Avco-Everett Res. Rept.-159) OTS: $1.60 ph, $0.80 mf

The flow of an infinitely conducting plasma past a two-dimensional magnetic dipole oriented parallel to the flow has been considered by Hurley, among others. The problem consists of finding a vacuum magnetic field such that along a bounding field line whose location is to be found, the magnetic pressure balances the Newtonian dynamic pressure appropriate to the local slope of the boundary. A related problem has been solved where there is no flow, but an isotropic static plasma surrounding the magnetic field region which exerts a constant pressure on the boundary. In the actual flow problem, a stagnant (trapped) region near the front would be at nearly constant pressure. Away from this region the Newtonian pressure would again be applicable. This problem, which is a mixture of those cited above, has been solved by an approximate technique due to Cockroft. Author

N64-11427 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
THE DIFFUSION OF CHARGED PARTICLES OF A PLASMA IN A MAGNETIC FIELD
V. E. Golant [1963] 110 p refs Transl. into ENGLISH from Usp. Fiz. Nauk (Moscow), v. 79, no. 3, Mar. 1963 p 377–440
(*Its* Transl. 464)

This article represents a systematic survey of investigations on the diffusion of plasma in a magnetic field. The theory of diffusion is related to particle collisions. The experimental investigations of the diffusion of charged particles of a weakly ionized gas in a magnetic field, and the experimental investigations of the diffusion of charged particles of a strongly ionized gas in a magnetic field, are also discussed. Author

25 PHYSICS, SOLID-STATE

Includes semiconductor theory; and masers. ***For related information see***: 09 Electronics; 23 Physics, General; and 24 Physics, Plasma.

N64-10708 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM FIZIKA TVERDOGO TELA (SOLID STATE PHYSICS) [LENINGRAD V. 4] NO. 7, 1962
18 Feb. 1963 50 p refs Transl. into ENGLISH of four articles p 1735–1942; 1846–1852; 1878–1881; 1959–1960
(JPRS-17689; OTS-63-21152) OTS: $1.25

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1. TENSILE TESTING OF THREAD-LIKE CRYSTALS OF COPPER, NICKEL, AND COBALT S. Z. Bokshteyn, S. T. Kishkin, and T. L. Svetlov p 1–17 refs (See N64-10709 02-25)

2. EFFECT OF ANNEALING ON THE DENSITY OF DISLOCATIONS AND COMPRESSION CURVES OF GERMANIUM CRYSTALS V. G. Govorkov and V. S. Papkov p 18–33 refs (See N64-10710 02-25)

3. INTERACTION OF EDGE DISLOCATION WITH VACANCIES IN SILICON L. S. Milevskiy p 34–42 refs (See N64-10711 02-25)

4. DISCRETE STRUCTURE OF ELASTIC STRESSES FORMED BY A SERIES OF DISLOCATIONS IN SILICON L. S. Milevskiy p 43–47 refs (See N64-10712 02-25)

N64-10709 Joint Publications Research Service, Washington, D.C.

TENSILE TESTING OF THREAD-LIKE CRYSTALS OF COPPER, NICKEL, AND COBALT

S. Z. Bokshteyn, S. T. Kishkin, and I. L. Svetlov *In its* Transl. from Fiz. Tverd. Tela. (Solid State Phys.) [Leningrad V. 4] No. 7, 1962 18 Feb. 1963 p 1–17 refs (See N64-10708 02-25) OTS: $1.25

Results are presented of the tensile testing of thread-like crystals of copper, nickel, and cobalt grown by the reduction of halides. Tensile testing of the whiskers of copper, nickel, and cobalt indicated that the yield strength sharply increases with a decrease in the diameter of the whisker. At 3 to 5 microns, a strength equal to 210 to 330kg/mm^2 was obtained, whereas at 13 to 15 microns it was lowered to values characteristic for the usual monocrystals. R.T.K.

N64-10710 Joint Publications Research Service, Washington, D.C.

EFFECT OF ANNEALING ON THE DENSITY OF DISLOCATIONS AND COMPRESSION CURVES OF GERMANIUM CRYSTALS

V. G. Govorkov and V. S. Papkov *In its* Transl. from Fiz. Tverd. Tela. (Solid State Phys.) [Leningrad V. 4] no. 7, 1962 18 Feb. 1963 p 18–32 refs (See N64-10708 02-25) OTS: $1.25

In the initial stage of compression and extension of Ge monocrystals, in a given temperature range and deformation rate, a sharp drop of tension ("tooth" of fluidity) is observed. Annealing of Ge specimens, deformed by compression at 7 890° C for 2.5 hours, caused a rearrangement of dislocations resulting in the formation of blocks of polygonization. Annealing of deformed Ge specimens did not reduce the "tooth" of fluidity but resulted in lowering the yield point. The "tooth" of fluidity on compression curves was not connected with the initiation of plastic deformation, the traces of which appear considerably earlier. R.T.K.

N64-10711 Joint Publications Research Service, Washington, D.C.

INTERACTION OF EDGE DISLOCATIONS WITH VACANCIES IN SILICON

L. S. Milevskiy *In its* Transl. from Fiz. Tverd. Tela. (Solid State Phys.) [Leningrad V. 4] no. 7, 1962 18 Feb. 1963 p 34–42 refs (See N64-10708 02-25) OTS: $1.25

The polarization-optical method combined with the selective etching and marking of dislocations was used to study the interaction of edge dislocations of opposite charges with point defects. Dislocation creep during the absorption of excess vacancies in silicon is discussed. Data are presented on: (1) the relative position of the dislocations in a silicon crystal, (2) the character of the deposition of copper during coloring, demonstrating that edge dislocations absorb excess vacancies, and (3) dislocation creep near the surface of the crystal. R.T.K.

N64-10712 Joint Publications Research Service, Washington, D.C.

DISCRETE STRUCTURE OF ELASTIC STRESSES FORMED BY A SERIES OF DISLOCATIONS IN SILICON

L. S. Milevskiy *In its* Transl. from Fiz. Tverd. Tela. (Solid State Phys.) [Leningrad V. 4] no. 7, 1962 18 Feb. 1963 p 43–47 refs (See N64-10708 02-25)

Specimens of silicon grown horizontally were studied in order to determine the discrete structure of stresses of a series of slidings. The dislocation theory of internal stresses was confirmed by use of the polarized-optical method of studying the discrete structure of the elastic field in the series of slidings. R.T.K.

N64-10732 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM FIZIKA TVERDOGO TELA (SOLID STATE PHYSICS) NO. 9, 1962

7 Mar. 1963 25 p refs Transl. into ENGLISH of three articles, (Leningrad), v. 4, Sep. 1962 p 2447–2449; 2585–2596; 2593–2596
(JPRS-18008; OTS-21272) OTS: $0.75

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1. EDGE DISLOCATION CLIMB IN SILICON UNDER ACTION OF GOLD L. S. Milevskiy p 1–5 refs (See N64-10733 02-25)

2. A STRAIGHT-LINE DISLOCATION NEAR THE PLANE OF DISCONTINUITY OF ELASTIC CONSTANTS IN AN UNLIMITED ANIZOTROPIC MEDIUM L. A. Pastur, E. P. Fel'dman, A. M. Kosevich, and V. M. Kosevich p 6–16 refs (See N64-10734 02-25)

3. CONDITIONS OF DISLOCATION PINNING IN CLUSTERS B. A. Grinberg p 17–22 refs (See N64-10735 02-25)

N64-10733 Joint Publications Research Service, Washington, D.C.

EDGE DISLOCATION CLIMB IN SILICON UNDER ACTION OF GOLD

L. S. Milevskiy *In its* Transl. from Fiz. Tverd. Tela (Solid State Phys.) no. 9, 1962 7 Mar. 1963 p 1–5 refs (See N64-10732 02-25) OTS: $0.75

Edge dislocation climb of opposite charges under the action of dissolved gold was studied. It was shown that edge dislocations leave the second phase particles and climb in the direction of the increasing sizes of the remaining atomic densities. Author

N64-10734 Joint Publications Research Service, Washington, D.C.

A STRAIGHT-LINE DISLOCATION NEAR THE PLANE OF DISCONTINUITY OF ELASTIC CONSTANTS IN AN UNLIMITED ANISOTROPIC MEDIUM

L. A. Pastur, E. P. Fel'dman, A. M. Kosevich, and V. M. Kosevich *In its* Transl. from Fiz. Tverd. Tela. (Solid State Phys.) no. 9, 1962 7 Mar. 1963 p 6–16 refs (See N64-10732 02-25) OTS: $0.75

The fields of stress and displacement from dislocations found near the plane of discontinuity of elastic constants in an unlimited anisotropic medium were calculated. Certain partial cases were examined—dislocation in a bicrystal with the plane of symmetry perpendicular to the dislocation line, and dislocation in a free surface. A formula was obtained for the dislocation interaction force with the plane of discontinuity of elastic constants. Author

N64-10735 Joint Publications Research Service, Washington, D.C.

CONDITIONS OF DISLOCATION PINNING IN CLUSTERS

B. A. Grinberg *In its* Transl. from Fiz. Tverd. Tela. (Solid State Phys.) no. 9, 1962 7 Mar. 1963 p 17–22 refs (See N64-10732 02-25) OTS: $0.75

Conditions of dislocation pinning in clusters with impure atoms, including the migration of the impure atoms to dislocations, were studied. During the formation of clusters, the dislocations are subject to the action of the growing field of stresses of the approaching dislocations. The interaction between dislocations and impure atoms is considered to be elastic. The number of impure atoms migrating to dislocations is determined according to the Cottrell–Bilby theory of aging. Estimates of the order of the values determining the possibility of pinning are presented. Author

N64-10738 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM FIZIKA TVERDOGO TELA (SOLID STATE PHYSICS) NO. 10, 1962

11 Mar. 1963 42 p refs Transl. into ENGLISH of three articles (Leningrad), v. 4 p 2733–2737; 2901–2907; 2917–2920

(JPRS-18062; OTS-63-21298) OTS: $1.25

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1. FORCE OF FRICTION ACTING ON A MOVING DISLOCATION A. I. Landau p 1–11 refs (See N64-10739 02-25)
2. MECHANICAL PROPERTIES OF ORDERED COPPER-GOLD ALLOYS V. I. Syutkina and E. S. Yakobleva p 12–30 refs (See N64-10740 02-25)
3. DETECTION OF DISLOCATION IN MONOCRYSTALS OF SILICON DURING DISSOLUTION WITH PAIRS OF OTHER SUBSTANCE A. V. Sandulova and M. I. Dronyuk p 31–39 refs (See N64-10741 02-25)

N64-10739 Joint Publications Research Service, Washington, D.C.

FORCE OF FRICTION ACTING ON A MOVING DISLOCATION

A. I. Landau *In its* Transl. from Fiz. Tverd. Tela (Solid State Phys.) No. 10, 1962 11 Mar. 1963 p 1–11 refs (See N64-10738 02-25) OTS: $1.25

On the basis of the Peierls–Nabarro model, the frictional force acting on a moving dislocation is calculated. This force is connected with the effect noted by Frenkel' and Kontorova of forced oscillations of atoms of a crystal lattice in the transformation plane. A theoretically computed estimate is made of the frictional force acting on boundary and helical dislocations in a crystal of LiF. Definite results are obtained which indicate the difficulty or even the practical impossibility of the movements of fast (relativistic) dislocations in crystals with low Debye temperature values. Author

N64-10740 Joint Publications Research Service, Washington, D.C.

MECHANICAL PROPERTIES OF ORDERED COPPER-GOLD ALLOYS

V. I. Syutkina and E. S. Yakobleva *In its* Transl. from Fiz. Tverd. Tela (Solid State Phys.) No. 10, 1962 11 Mar. 1963 p 12–30 refs (See N64-10738 02-25) OTS: $1.25

Examined is the effect of ordering on the mechanical properties of copper–gold alloys. It is shown that the relation of mechanical properties to the concentration is strongly changed with ordering. The ordering effect can be successfully explained by the change in the elementary defect of the lattice, responsible for the plastic deformation of alloys. Author

N64-10741 Joint Publications Research Service, Washington, D.C.

DETECTION OF DISLOCATION IN MONOCRYSTALS OF SILICON DURING DISSOLUTION WITH PAIRS OF OTHER SUBSTANCE

A. V. Sandulova and M. I. Dronyuk *In its* Transl. from Fiz. Tverd. Tela (Solid State Phys.) No. 10, 1962 11 Mar. 1963 p 31–39 refs (See N64-10738 02-25) OTS: $1.25

A new method is proposed for studying dislocations in crystallographic planes (111) and (100) monocrystals of silicon. Detection of dislocations by the proposed method is carried out by annealing the crystals in Se, S, Te, J, and Br pairs. Author

N64-10824 Pittsburgh U., Pa.

INTERMOLECULAR FORCES AND THE SPACE GROUP OF SOLID CHLORINE

S. C. Nyburg (Keele U., Gt. Brit.) [1963] 31 p refs

(NSF Grant 19797)

Use of the 6:12 potential for Cl_2, and presumably for other halogen molecules, shows that the observed orthorhombic Cmca space group in which they crystallize is not that predicted; both the cubic Pa3 and the hexagonal P6m2 would be more stable crystal structures. A molecular model is discussed in which, compared to the free halogen atoms, the molecule has, in addition to concentration of charge at its center, a charge concentration at its outer ends. This model correctly predicts the Cmca space group and the orientation of the molecules in the unit cell. The calculations also show why certain other simple molecules crystallize in Pa3. Author

N64-10855 Joint Publications Research Service, Washington, D.C.

NATURE OF SPIN-LATTICE INTERACTION IN MAGNETIC-DILUTED FREE RADICALS

A. V. Il'yasov, N. S. Garif'yanov, and R. Kh. Timerov (Acad. Sci. USSR, Kazan) *In its* Interaction of Free Radicals 21 Nov. 1963 p 7–11 refs Transl. into ENGLISH from Doklady Akad. Nauk USSR (Moscow), v. 150, no. 3, 1963 p 588–591 (See N64-10853 02-01) OTS: $0.50

The electron paramagnetic resonance (EPR) in a solid (supercooled) solution of free radicals of α, α-diphenyl-β-picrylhydrazine (DPPH) and 2,2,6,6-tetramethylpentamethylene of nitric oxide (TMPMNO) was studied. As solvents, methanol, ethanol, benzene, toluene, and mixtures of these alcohols with glycerine and water were used. Measurements of the relaxation time were made on the standard radiospectrometer, using the method of continuous saturation. The time of the longitudinal relaxation was computed from the Bloch formula. In liquid solutions of free radicals, the spin-lattice relaxation mechanism was shown to depend, essentially, on the nature of the solvent. R.T.K.

N64-10979 Pittsburgh U., Pa. Crystallography Lab.

THE POLYHEDRAL CLATHRATE HYDRATES. PART IV: THE LATTICE TYPE AND ION DISTRIBUTION IN SOME NEW PER-ALKYL AMMONIUM, PHOSPHONIUM AND SULFONIUM SALT HYDRATES

Gezina Beurskens, G. A. Jeffrey, and R. K. Mc Mullan 1963 12 p refs

(Supported by Dept. of the Interior Grant)

The crystal data and preparation are discussed for twenty-two new per-alkylated ammonium, phosphonium, and sulfonium salt hydrate crystals. Although these structures have not been determined in detail, it is possible to classify them according to the host lattice type and to draw conclusions by analogy with known structures concerning the order and disorder in the distribution of the cations and anions with respect to the water lattice. Author

N64-10997 Joint Publications Research Service, Washington, D.C.

CRYSTAL STRUCTURE RESEARCH

7 Feb. 1963 38 p refs Transl. into ENGLISH of two articles from a book "Issledovaniya po Zharoprochnym Splavam" v. 6, Moscow, 1960 p 120–129; 251–258
(JPRS-17529; OTS-63-21077) OTS: $1.00

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1. ON THE EFFECT OF UNSTABLE DEFECTS OF CRYSTAL STRUCTURE ON THE MOBILITY OF ATOMS IN NICKEL AND IRON ALLOYS I. Ya. Dekhtyar and V. S. Mikholenkov p 1–19 refs (See N64-10998 02-25)
2. STUDY OF DEFECTS IN THE CRYSTAL STRUCTURE OF CHROMIUM S. S. Gertsriken, I. Ya. Dekhtyar, L. M. Kumok, and E. G. Madatova p 20–35 refs (See N64-10999 02-25)

N64-10998 Joint Publications Research Service, Washington, D.C.

ON THE EFFECT OF UNSTABLE DEFECTS OF CRYSTAL STRUCTURE ON THE MOBILITY OF ATOMS IN NICKEL AND IRON ALLOYS

I. Ya. Dekhtyar and V. S. Mikhalenkov *In its* Crystal Struct. Res. 7 Feb. 1963 p 1–19 refs (See N64-10997 02-25)

An investigation was made of the plastic deformation of metals and alloys that: (1) increase the distortion of the crystal lattice, (2) cause the appearance of a large number of various types of defects in crystal structure, and (3) influence the diffusion parameters. The samples investigated were binary alloys of nickel–molybdenum. The dependence of the diffusion coefficients on the rate of high-temperature plastic deformation was determined, for the specimens indicated, at various temperatures. The linear dependence of the coefficient of diffusion on the rate of deformation was established for technically pure metal, a number of binary alloys, and a complex ferrite-type alloy. The values of the coefficient of softening, and the activation energy of diffusion in crystal with high-temperature plastic deformation were also calculated. R.T.K.

N64-10999 Joint Publications Research Service, Washington, D.C.

STUDY OF DEFECTS IN THE CRYSTAL STRUCTURE OF CHROMIUM

S. D. Gertsriken, I. Ya. Dekhtyar, L. M. Kumok, and E. G. Madatova *In its* Crystal Struct. Res. 7 Feb. 1963 p 20–35 refs (See N64-10997 02-25)

An investigation was made of the tendency of chromium to form metastable dislocations as a result of its deformation at high temperatures. X-ray and electrical methods were used for determining the density of dislocations. An investigation was also made of the effect of thermal cycling on the appearance of defects in chromium. It was found that with an increase in the number of thermal cycles, the hardness increases and the rate of its increase as a function of the number of cycles is decreased with an increase in external force. The destruction of chromium from thermal fatigue is explained by effects taking place in the surface layer, since the cyclical treatment changes the energy of dislocations in it and, consequently, its plastic properties. R.T.K.

N64-11019 Joint Publication Research Service, Washington, D.C.

GROWING LARGE TUNGSTEN CRYSTALLITES BY RECRYSTALLIZATION DURING SINTERING OF TUNGSTEN SAMPLES

O. V. Mitrofanov *In its* Soviet Expt. with Tungsten, Molybdenum and Alloys of Refractory Metals 5 Mar. 1963 p 34–41 refs Transl. into ENGLISH of an article from Fiz. Metallov i Metalloved. (Moscow), v. 13, no. 5, 1962 p 760–762 (See N64-11014 02-01) OTS: $1.50

Large tungsten crystallites, of interest in the study of recrystallization processes, were grown in order to investigate certain physical processes, such as electron emission and sorption. The basic factors which determine the size of tungsten crystallites during recrystallization are discussed. These factors are: additions (mostly potassium, aluminum, and silicon), the particle size of the tungsten powder, the specific applied pressure, sintering temperature, the temperature gradients during sintering, and the amount of water vapor in the hydrogen during the sintering process. Detailed procedures are given of the method utilized in the growing of the tungsten crystallites. C.L.W.

N64-11022 Joint Publications Research Service, Washington, D.C.

PHOTOELECTRIC PROPERTIES OF GERMANIUM DOPED WITH GOLD AND ZINC

V. I. Sidorov and T. M. Lifshits 6 Mar. 1963 24 p refs Transl. into ENGLISH of an article from Radiotekh. i Elektron. (Moscow), no. 12, Dec. 1962 p 2076–2085
(JPRS-17980; OTS-63-21260) OTS: $0.75

Investigated is the dependence of spectral voltage and current photosensitivities of samples of Ge : Au : Sb and Ge : Zn : Sb on the concentration of impurity centers and the degree of their compensation, and also the temperature dependence of photosensitivity. It is shown that the voltage sensitivity does not depend on the concentration of the impurity and the degree of its compensation, while the current sensitivity is determined by the ratio N_d/N_a. For samples with a specific type of impurity center, there is a critical temperature above which the photosensitivity drops sharply. Author

N64-11028 Lear Siegler, Inc., Santa Monica, Calif.

SEMICONDUCTOR THIN FILMS Quarterly Report No. 7, 1 Jul.–30 Sep. 1963

[1963] 49 p refs
(Contract AF 33(657)-7623)
(AD-423328)

Progress is reported in heat treatment, light-emitting devices, microseeding, ultrahigh vacuum, lifetime measurement, Hall measurement, electron microscopy, film deposition, thinned bulk films, and electronic properties of thin films. J.E.T.

N64-11115* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

DEMONSTRATION MODEL OF SPHERICAL PROJECTION FOR CUBIC CRYSTALS

Adolph E. Spakowski and Robert J. Bacigalupi Repr. from Am. J. Phys., v. 31, no. 10, Oct. 1963 p 807
(NASA RP-83)

A demonstration model of spherical projection for cubic crystals is described. The 8-inch sphere was machined from a laminated block of Lucite. The major zones of a cubic crystal were then inscribed on the surface, and all of the poles usually associated with standard projections were marked with the respective Miller indices. Filling the zones and poles with suitable colored pigments resulted in a legible and quite durable model. The sphere is mounted on a base in such a manner that it can be rotated easily in any direction. The vernier protractor is used to measure the angular distance between any two-pole positions on the sphere. The model has found extensive use in demonstrating clearly the relation of crystallographic planes to one another, while allowing accurate measurement of interplanar angles. Also, it has practical utility in the initial interpretation of fixed single-crystal diffraction patterns. I.v.L.

N64-11342 Oak Ridge National Lab., Tenn.
AN EXPERIMENTAL STUDY OF SORPTION OF URANIUM HEXAFLUORIDE BY SODIUM FLUORIDE PELLETS AND A MATHEMATICAL ANALYSIS OF DIFFUSION WITH SIMULTANEOUS REACTION
L. E. Mc Neese (M.S. Thesis–Tenn. U.) 29 Nov. 1963 137 p refs
(Contract W-7405-eng-26)
(ORNL-3494)

The results of this study indicate that the rate-controlling mechanisms are: transfer of uranium hexafluoride across a stagnant gas film surrounding the pellet, diffusion of gaseous uranium hexafluoride in the pores of the pellet, and diffusion of uranium hexafluoride through a layer of uranium hexafluoride–sodium fluoride complex covering the unreacted sodium fluoride in the interior of the pellet. The crystalline density of the complex, $UF_6 \cdot 2NaF$, was determined to be 4.13 g/cm^3 which indicates that incomplete reaction of the sodium fluoride will occur for pellets in which the initial volume void fraction is less than 0.807. A useful model was devised to represent the sorption of uranium hexafluoride by a single pellet of sodium fluoride, and differential equations based on the model were written. A general method of solution of the partial differential equation describing simultaneous diffusion and irreversible reaction with variable diffusivity and reaction rate constant was derived for systems in which a steady-state type of solution is valid. Author

N64-11365 Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia)
ON THE MOBILITY OF INTERSTITIALS
P. Gosar Mar. 1963 17 p refs
(NIJS R-412)

A temperature-dependent Green's function method is used for the calculation of interstitial mobility. A quantum-mechanical expression for ν_0 in the formula $\nu = \nu_0 \exp(-U/kT)$ for the jumping frequency from one interstitial site to a neighbor one is derived. The theory avoids the concept of the transition state, used in classical theories. The interactions of interstitials with phonons are taken explicitly into account. Author

N64-11389 Los Alamos Scientific Lab., N. Mex.
AN INTEGRATED SERIES OF CRYSTALLOGRAPHIC COMPUTER PROGRAMS I. CRYSTAL ORIENTATION
Allen C. Larson, Don T. Cromer, and R. B. Roof, Jr. 14 Nov. 1963 36 p ref
(Contract W-7405-ENG-36)
(LA-2974) OTS: $0.75

The procedures employed and the computer program used for the determination of single-crystal orientation prior to intensity measurements are described. Author

N64-11422* Rice U., Houston, Tex.
THE CRYSTAL STRUCTURES OF BARIUM CHLORIDE, BARIUM BROMIDE, AND BARIUM IODIDE
Elizabeth B. Brackett, Thomas E. Brackett, and Ronald L. Sass
Repr. from J. Phys. Chem., v. 67, no. 2132, 1963 p 2132–2135 refs
(NASA Grant NsG-6-59)

The crystal structures of the orthorhombic modification of the $BaCl_2$, $BaBr_2$, and BaI_2 have been determined by X-ray diffraction of powder samples. The object of the investigation has been to obtain accurate atomic parameters necessary for the calculation of lattice energies. These parameters were refined by the method of least squares. Author

26 PROPELLANTS AND COMBUSTION

Includes fuels; igniters; and oxidizers. *For related information see*: 07 Chemistry; and 27 Propulsion.

N64-10716 Joint Publications Research Service, Washington, D.C.
ANTI-CORROSION PROTECTION OF MOBILE TANKS FOR PETROLEUM PRODUCTS
M. V. Lykov, I. D. Inozemtsev, and V. M. Karpova 20 Feb. 1963 16 p refs Transl. into ENGLISH from Lakokrasochnye Materialy i ikh Primenenie (Leningrad), no. 2, 1962 p 34–40
(JPRS-17742; OTS-63-21180) OTS: $0.50

Results of tests conducted on anticorrosion coatings for petroleum storage tanks are discussed. Types of coatings tested include: enamels, polyurethane, resin-based coatings, resol resin-based coatings, and coatings based on pigmented ethynol lacquer. Results of the testing showed: (1) an increase in the temperature of the petroleum products to 50° did not cause any significant changes in the coatings; (2) the films of all the naturally-dried coatings swelled considerably after extended contact with water, and were covered with fine bubbles which broke up under mechanical action; (3) brief exposure to hot water and raw steam does not show significant influence on the coatings; and (4) for tanks with petroleum products containing water, it is necessary to use hot-dried coatings. Processing techniques for applying anticorrosion protective coatings to mobile tanks are also discussed. P.V.E.

N64-10718 Joint Publications Research Service, Washington, D.C.
DISPERSION OF INSOLUBLE PRECIPITATES FORMED WHILE HEATING FUELS
Ya. B. Chertkov and V. M. Shchagin 21 Feb. 1963 20 p Transl. into ENGLISH from Khim. i Tekhnol. Topliv i Masel (Moscow), v. 4, no. 11, 1959 p 23–28
(JPRS-17760; OTS-63-21183) OTS: $0.50

An investigation of the change in the size of particles of precipitates formed in diesel fuels of various composition (distillates and with admixtures of components of catalytic and thermal cracking) indicated that: (1) increasing the heating temperature above 150 to 190 degrees, for a fuel whose boiling point lies within the range of boiling points of ligroin-kerosene fractions, results in a considerable reduction in the number of precipitates formed and an increase in the particle size; (2) for temperatures of 150 to 250 degrees, the size of the particles of the fuel precipitate is within 50 to 120 microns, and for fuels heated to 150 degrees, the size of the particles does not exceed 50 microns; and (3) pressures up to five atmospheres exert no effect on the change in size of precipitate particles formed in the fuel. P.V.E.

N64-10722 Joint Publications Research Service, Washington, D.C.

CERTAIN METHODOLOGICAL PROBLEMS IN THE FUEL-POWER BALANCE

S. Lisichkin and L. Tomashpol'skiy 25 Feb. 1963 13 p Transl. into ENGLISH from Vopr. Ekon. (Moscow), no. 11, Nov. 1962 p 48–55

(JPRS-17782) OTS: $0.50

A statistical history of coal, petroleum, natural gas, and hydroelectric power production and usage in Russia is presented. Methods of increasing fuel-usage efficiency are suggested. J.E.T.

N64-10724 Joint Publications Research Service, Washington, D.C.

DIESEL FUEL FILTRATION

L. A. Yemel'yanov 26 Feb. 1963 26 p refs Transl. into ENGLISH from Tr. Tsentr. Nauchn.-Issled. Dizel'nogo Inst. (Moscow), no. 37, 1961 p 70–82

(JPRS-17826; OTS-63-21210) OTS: $0.75

The characteristics of the filtration process in internal combustion engines, the properties of filtering materials and certain procedure problems are investigated in the article. Author

N64-10890* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ORBIT DETERMINATION AND PREDICTION, AND COMPUTER PROGRAMS

A. J. Claus, R. B' Blackman, E. G. Halline, and W. G. Ridgway, III *In its* Telstar I, Vol. 2, Jun. 1963 p 1357–1382 refs (See N64-10882 02-01)

Orbit determination and prediction programs are needed to generate ephemerides for the satellite. Orbit determination is from tracking data consisting of angles only. Trends in the data due to perturbations from a Keplerian orbit are removed before this process, and estimates of the orbital elements from individual passes are combined statistically to produce refined estimates. Ephemeris calculation is by a semi-analytic method in which deviations from a Keplerian orbit are obtained by integrating the perturbing forces. Author

N64-11027 Value Engineering Co., Alexandria, Va.

RESEARCH AND DEVELOPMENT ON ELECTRODEPOSITED COATINGS FOR HIGH TEMPERATURE EXPERIMENTAL SOLID PROPELLANT ROCKET NOZZLES Final Summary Report, 29 Jun. 1961–28 Apr. 1963

E. Goodman, R. A. Thompson, and H. P. Weinberg 27 May 1963 51 p

(Contract DA-36-034-ORD-3497-RD)

(AD-407973)

The heat treatment of electrodeposited, chromium-base, cermet coatings was investigated. It was determined that the heat treatment increases the life of the coating. ATJ graphite nozzles were coated with the cermet coating and heat treated at a series of temperatures and times. A heat treatment of five minutes at 1600° F appears to be the optimum conditions. Various methods to increase the concentration of ceramic particles in the coating were investigated. Mechanical agitation as opposed to air agitation was found to be more effective in causing particles to be occluded in the coating. It was determined that increasing the amount of ceramic particles in the plating bath caused an increase in the amount of particles "trapped" in the chromium. The gaseous oxygen–hydrogen rocket motor was modified and calibrated so that various oxygen–hydrogen ratios, chamber pressures, and flow rates could easily be obtained. It was determined that the erosion rate of ATJ graphite in the gaseous motor at 63.5 psi was twice as great as the erosion rate in a solid motor using Arcite 373 at 1000 psi. Author

N64-11204 Canadian Armament Research and Development Establishment, Valcartier

AN EXPERIMENTAL INVESTIGATION OF FINITE-WAVE AXIAL COMBUSTION INSTABILITY

W. G. Brownlee May 1963 42 p refs Presented at the Am. Inst. of Aeron. and Astronautics Natl. Summer Meeting on Experiments on Nonlinear Axial Combustion Instability in Solid Propellant Rocket Motors, Los Angeles, 17–20 Jun. 1963

(CARDE TM-660/63)

A pulse technique for injecting flow disturbances was developed. In general, the severity of instability increases monotonically with the level of the stable operating pressure. At sufficiently low pressure the instability cannot be triggered. The time-averaged unstable chamber pressure, P_{cus}, is strongly dependent on the ratio of the burning surface area to the throat area, K_n. It obeys the empirical relation

$$\bar{P}_{cus} = k\,K_n^{\beta}$$

where the constants k and β depend primarily on propellant composition and motor scale. The intercept of P_{cus} and the stable pressure P_{cs} defines a critical value of K_n, say K_n^*. Motors for which $K_n < K_n^*$ throughout firing are inherently stable with respect to the nonlinear axial mode. Therefore, a design criterion for stability can be obtained experimentally, provided scaling factors are known. The effect on K_n^* of changing the motor scale, length–diameter ratio, grain cross section, grain temperature, and of adding aluminum alloy and lithium fluoride to the propellant is discussed. Author

N64-11385 Oak Ridge National Lab., Tenn.

INSTRUMENT FOR DETERMINING CRUSHING STRENGTH OF PARTICLES

George Hallerman and R. J. Gray 29 Nov. 1963 16 p

(Contract W-7405-ENG-26)

(ORNL-3512)

An instrument for crushing-strength determinations of uncoated and pyrolytic carbon-coated fuel particles (50μ to 500μ in diameter) has been developed to relate the crushing strength of the particles to their fabricability. The instrument consists of a loading mechanism, load cell, and a power supply-readout unit. The information that can be obtained by statistical methods of the data analysis is illustrated by results on two batches of fuel particles. Author

N64-11435 Thiokol Chemical Corp., Denville, N.J. Reaction Motors Div.

CHARACTERISTICS OF DIBORANE FLAMES

H. G. Wolfhard, A. H. Clark, and M. Vanpee Charlottesville, Va., U., Nov. 1963 25 p refs Presented at the AIAA Conf. on Heterogeneous Combust., Dec. 1963

(Contract Nonr 3623(00); Proj. Squid)

(RMD-3-P)

Limits of flame propagation for diborane or pentaborane are very wide indicating very low limit temperature. This fact allows greatly diluted or very lean fuel flames to be burned at one atmosphere on sintered discs. The undiluted diborane air flame, in contrast, has a quenching diameter which is only a small friction of a millimeter. Burning velocity measurements are thus difficult and not very accurate. The burner method for diborane air, as well as an investigation of spherical flame propagation using pentaborane air, yielded about 5m/sec. This is the highest burning velocity ever measured with air and compares with hydrogen air—3 m/sec, acetylene air—1.5 m/sec, and methane air—0.4 m/sec. For pentaborane air, the burning velocity doubled when the oxygen index of air increased from 0.21 to 0.26. This indicates potentially very large velocities in pure oxygen. Author

27 PROPULSION

Includes airbreathing, electric, liquid, nuclear, and solid propulsion. *For related information see*: 04 Aircraft; 06 Auxiliary Systems; 26 Propellants and Combustion; and 30 Space Vehicles.

N64-10777 Joint Publications Research Service, Washington, D.C.
THE ENGINE OF TOMORROW. ROTATING OR RECIPROCATING PISTON?
Louis Rubel *In its* Transl. from Stiint. si Tech. (Sci. and Technol.) [Bucharest] v. 14 [no. 9 and no. 11], Sep.–Nov. 1962. (Air Transport and Space Sci.) 4 Apr. 1963 p 20–27 (See N64-10773 02-01) OTS: $0.75

A short history of reciprocating engines, from steam engines to rotating engines (Wankel engine), is presented. An "orbital engine" is described in which the pistons make an alternating oscillating movement, and which has the advantages of a rotation engine without having rotating pistons. Its dimensions do not exceed the size of a soccer ball, and it has no forces of inertia. The body of the engine, together with the pistons, rotates around a fixed axis in which there are holes for oil and fuel. On the axis, at an angle, is a wobble plate on which are mounted, on spheric articulations, six curvilinear pistons oscillating in curvilinear canals (which take the place of cylinders). The experimental model weighs 50 kg, has a diameter of 250 mm, and a speed of 3,000 rpm. P.V.E.

N64-10970 Entwicklungsring Sud, Munich (W. Germany)
PROBLEMS OF AIR INTAKES IN VERTICAL TAKEOFF AIRCRAFT WITH TL-ENGINES [DIE PROBLEME DER LUFTEINLAUFE BEI SENKRECHTSTART-FLUGZEUGEN MIT TL-TRIEBWERKEN]
Helmut Langfelder Sep., 1963 35 p refs In GERMAN
(EWR-88-63)

For both lifting engines and lifting-"driving" engines the air intake of vertical take off aircraft must satisfy special demands, since extreme operating conditions arise during takeoff and landing, and during the transition flight. The effect of nonuniform intake flow and pressure loss is observed best by examining the characteristics curve of the engine compressor. Therefore, the lifting engine intakes of the VJ 101 C are described, and their performance is illustrated by means of wind-tunnel measurements. Also, the interference effect of the exhaust jets at the starting of the engine during flight is discussed in connection with the intake pressure recovery. The intake of the pivoting nacelle of the VJ 101 C in the slow flying range, particularly at large angles-of-attack, has an additional auxiliary slit which supplies the engine with sufficient air. A survey is given of the amount of developmental work conducted on the air intake of the VJ 101 C as an estimate of the even greater work expenditure required for vertical takeoff aircraft. I.v.L.

N64-11190 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ONE METHOD OF DETERMINING THE CRITERION OF OPERATIONAL STABILITY OF A LIQUID-PROPELLANT ROCKET ENGINE
G. I. Zamuruyev 16 Aug. 1963 26 p refs Transl. into ENGLISH from Mosk. Vyssheye Tekh. Uchilishche, Mekh., no. 92, 1959 p 64–84
(FTD-TT-63-491/1+2+4; AD-420602)

A method is presented which can be used for determining the criteria for operating stability of liquid-propellant rocket engines (LRE) with separate feeding of fuel and oxidizer. Criteria are first established for LRE with a mono(single-component)propellant using equations of motions, and then extending the results to an LRE with separate feeding of fuel and oxidizer. P.V.E.

N64-11300* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PERFORMANCE ANALYSIS OF HIGH-ENERGY CHEMICAL STAGES FOR INTERPLANETARY MISSIONS. PART II: BRAKE TO VENUS ORBIT
Walter H. Stafford and Sam H. Harlin 17 May 1963 40 p refs (NASA TM X-51104; MTP-P&VE-F-63-9) OTS: $3.60 ph, $1.40 mf

The effect of earth thrust-to-weight ratios, and specific impulses on trajectory parameters have been investigated for braking to an orbit about Venus. The thrust vector was directed against the velocity vector in all instances. Specific impulses of 400 to 500 sec and earth thrust-to-weight ratios of 0.2 to 1.0 were used. Author

N64-11397* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
POTENTIALS OF RADIOISOTOPE ELECTROSTATIC PROPULSION
William R. Mickelsen and Charles A. Low, Jr. Repr. from Astronautics and Aerospace Eng. Oct. 1963 p 52–57 refs

Problems are discussed which arise in considering the practical feasibility of the radioisotope electrostatic propulsion system which has been proposed as a method of providing propulsion systems superior in performance to the performance of other space propulsion systems, such as the nuclear rocket. The very high voltage, direct current power provided by the radioisotope electrostatic system is ideally suited to integration with the colloidal-particle electrostatic thrustor. With this high voltage power, the colloidal-particle thrustor gives promise of high efficiency throughout the specific impulse range of interest for interplanetary missions, but radioisotope availability, radiation hazards, and mating with chemical boosters pose difficulties. An attempt is made to assess these problems, to discuss possible solutions, and to estimate the potentialities of the radioisotope electrostatic propulsion system for future space missions. C.L.W.

N64-11434 Pratt and Whitney Aircraft, East Hartford, Conn.
PROPULSION SYSTEMS FOR SUPERSONIC TRANSPORTS
T. G. Slaiby and R. L. Staubach New York, Soc. of Automotive Engr. [1962] 7 p Presented at the SAE Natl. Aeron. and Space Eng. and Manuf. Meeting, Los Angeles, 8–22 Oct. 1962 (SAE Paper 586A)

The problems of selecting an optimum type and configuration of a powerplant for the supersonic transport are discussed. Three types of powerplants have been considered—the turbojet, the turbofan, and the turbo-ramjet. The turbo-ramjet is found to be the least desirable. Consideration is given to the total integration of the complete propulsion system in order to achieve the high degree of performance required by the supersonic transport. The importance of integration of the inlet, engine, and nozzle to some of the other engine design variables, such as pressure ratio, bypass ratio, and turbine inlet temperature, is also discussed. C.L.W.

N64-11438* Aerojet-General Corp., Sacramento, Calif.
STUDY OF HIGH EFFECTIVE AREA RATIO NOZZLES FOR SPACECRAFT ENGINES Interim Report [18 Apr. 1962-18 Apr. 1963]
L. H. Paynter 16 Sep. 1963 432 p refs
(NASA Contract NAS7-136)
(NASA CR-52870; NAS7-136-01F) OTS: $22.25 ph, $13.16 mf

Reported is a study to increase the performance in spacecraft engines by increasing the effective nozzle expansion ratio, and to originate new nozzle concepts that offer increased space-vehicle performance. In the nozzle-performance analysis, the effects of wall friction, nozzle geometry, chemical kinetics, and heat transfer are considered. Engine designs are presented for both pump- and pressure-fed engines with the nine selected nozzles. The mission-analysis results indicate that the relative payload capabilities for all nozzles considered are within 6%, including the aerodynamic nozzle, which had the poorest payload capability. The results of the analysis indicate that the swirling-flow nozzle may offer significant advantages when the mission requires throttling capability. P.V.E.

28 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. *For related information see*: 05 Astronomy and Astrophysics; 16 Life Sciences; and 29 Space Sciences.

N64-10796 Joint Publications Research Service, Washington, D.C.
SPACE PHYSICS
G. A. Skuridin *In its* Studies in Biophys. 23 Apr. 1963 p 1-20 (See N64-10795 02-01) OTS: $1.00

The report presents basic results obtained by Soviet scientists in a physical study of outer space. Included are: (1) observations from earth satellites and space rockets; (2) density, pressure, and composition of the upper atmosphere; (3) a study of the ionosphere; (4) earth radiation belts and planetary plasma; (5) primary cosmic radiation; (6) measurement of the magnetic field of the earth and moon; (7) shortwave optical solar radiation; and (8) a study of meteorite materials. E.K.R.

N64-10875* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPACECRAFT RADIATION EXPERIMENTS
W. L. Brown, T. M. Buck, L. V. Medford, E. W. Thomas, H. K. Gummel, G. L. Miller (Brookhaven Natl. Lab.), and F. M. Smits (Sandia Corp.) *In its* Telstar I, Vol. I Jun. 1963 p 899-941 refs (See N64-10868 02-01)

The radiation experiments on the Telstar spacecraft were designed to measure the electron and proton particle distributions in the region of space explored by the satellite orbit and to give information on the integral semiconductor radiation damage produced by these particles. A soler aspect experiment is included with the radiation experiments because of its direct importance to solar cell damage results. The design and the hardware for these experiments are described. Author

N64-10895* National Aeronautical and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
RESULTS OF THE TELSTAR RADIATION EXPERIMENTS
W. L. Brown, J. D. Gabbe, and W. Rosenzweig *In its* Telstar I, Vol. 2, Jun. 1963 p 1505-1559 refs (See N64-10882 02-01)

The data from the particle experiments of the Telstar satellite have been analyzed to provide maps of the distribution of electrons and protons as measured in three of the Telstar detectors. For the protons between 26 and 34 Mev and >50 Mev, the particle distributions are stable in time, but for the electron distribution there is a time decay of the electron flux over most of the region explored by the Telstar orbit. The connection of these observations to the high-altitude nuclear explosion of July 9, 1962 is discussed. The particle maps have been used to derive the integral particle exposure of the satellite, which is found to account quantitatively quite well for the radiation damage observed in the main solar powerplant, and in the radiation damage experiments on solar cells and special damage transistors carried by the satellite. Author

N64-10916* Weather Bureau, Washington, D.C. National Weather Satellite Center
OBSERVING CORONAL EMISSION AND ABSORPTION BY MEANS OF ATOMIC OXYGEN IN THE HIGH ATMOSPHERE
S. Fred Singer *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 76-80 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

A technique is described for measuring the total amount of oxygen in the atmosphere between the earth and a satellite. I.v.L.

N64-10921* National Radio Astronomy Observatory, Green Bank, W. Va.
NRAO RADIOMETRIC EXPERIMENTS
Frank D. Drake *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 124-156 refs (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

Radiometers operating at short-centimeter wavelengths are three to five times less sensitive than is predicted by theory. This report discusses atmospheric radiation as the cause of this discrepancy in radiometric measurements. It is indicated that radiation from the sky will greatly deteriorate radiometer performance unless the beam is directed first at the planet, and then at the sky next to it. This procedure gives two equal readings of the atmospheric emissions which tend to cancel each other out. I.v.L.

N64-10929* Massachusetts Inst. of Tech., Cambridge
RADIOMETRIC MEASUREMENTS IN RADIO ASTRONOMY
Victor K. Chung *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 218-219 (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

Plans for a program in radio astronomy, which will investigate the Earth's atmosphere and the extraterrestrial sources of radio emission, are summarized as follows: (1) A ground-based radiometer looking skyward at various angles with respect to the zenith will be used for studying the distribution and abundance of water vapor in the atmosphere. The radiometer will track the Sun and the Moon. (2) Radiometric measurements will be taken of several sources, primarily Venus, Jupiter, and some of the other stronger sources.

(3) An attempt will be made to take spectra of gases at very high pressures. (4) Measurements of the emissive properties of some common materials will be made at frequencies planned for the radiometers. (5) An attempt will be made to transistorize all equipment so that it can be flown in a balloon and perhaps even in a satellite. I.v.L.

N64-10930* Geophysics Corp. of America, Bedford, Mass.

SOME METEOROLOGICAL INFERENCES FROM SATELLITE RADIOMETRY

J. I. F. King *In* RAND Corp. The Appl. of Passive Microwave Technol. to Satellite Meteorology: A Symp. Aug. 1963 p 220–238 ref (See N64-10911 02-01) OTS: $17.00 ph, $8.15 mf

Inferences which could be drawn from knowledge of the distribution of upswelling radiation, with a scan across either the frequency or the nadir angle, are reviewed. These inferences include: (1) the determination of the lapse-rate and dynamic stability of the atmosphere as a function of depth; the lapse-rate can be determined from radiometric data without calculating the temperature or height; (2) the determination of the radiative flux and the heating rate without any specific recourse to the temperature profile; this can be done by treating the intensity scan, rather than the thermal structure, as the independent variable; (3) the determination of the concentration ratio between two gases by "beating" the inverted frequency scans of the two emitting gases; and (4) the determination of the absorption coefficients of the gases by a "beating" technique which compares the frequency and the nadir-angle scans. I.v.L.

N64-10946* Lockheed Missiles and Space Co., Palo Alto, Calif.

METHODS FOR EXPERIMENTAL DETERMINATION OF THE EXTRA-TERRESTRIAL SOLAR ABSORPTANCE OF SPACECRAFT MATERIALS

R. E. Gaumer, E. R. Streed, and T. F. Vajta *In* NASA Measurement of Thermal Radiation Properties of Solids 1963 p 135–146 refs (See N64-10937 02-01) GPO: $3.50

Two basic methods of experimentally determining solar absorptance are described. Spectral diffuse reflectance and total simulated solar absorptance measurements are compared in terms of accuracy, instrumentation, sample requirements, and data reduction. The use of spectral data during material development to optimize desirable optical characteristics is shown. Typical data obtained by each method are included. Author

N64-10977* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE ROLE OF PLASMA INSTABILITIES IN THE ORIGIN OF SOLAR FLARES

R. K. Jaggi Repr. from J. Geophys. Res., v. 68, no. 15, 1 Aug. 1963 p 4429–4435 refs
(NASA RP-72)

The role of plasma instabilities in the origin of a solar flare have been investigated. Three types of stability problems are discussed: the magnetohydrodynamic instability of an infinitely conducting fluid, the instability due to the magnetic field gradients, and the finite conductivity instability. These instabilities are examined in a situation that occurs when two plasmas trapped in a pair of sunspot magnetic fields approach each other. The assumption of infinite conductivity gives rise to stable situations. The instability growth time in the magnetic field gradients that exist near sunspots is extremely large. The growth time for finite, conductivity instability is of the order of a few seconds or minutes, and it is therefore believed that the flare can be produced by finite conductivity instabilities in the solar atmosphere above a group of sunspots. Author

N64-10978 Pittsburgh U., Pa. Crystallography Lab.

POLYHEDRAL CLATHRATE HYDRATES. V. STRUCTURE OF THE TETRA N-BUTYL AMMONIUM FLUORIDE HYDRATE

R. K. Mc Mullan, M. Bonamico, and G. A. Jeffrey 1962 38 p 16 refs
(Supported by Dept. of the Interior Grant)

The structure of $(n-C_4H_9)_4N^+F^-32.8\ H_2O$ is tetragonal, space group $P4_2/m$ with unit cell dimensions $a = 23.52$ A, $c = 12.30$ A. The clathrate host structure is similar to that of the $(n-C_4H_9)_4N^+C_6H_5COO^-.39.5\ H_2O$ and consists of a tetragonal pseudobody-centered arrangement of groups of five face-sharing pentagonal dodecahedra interlinked by tetrakaidecahedra and pentakaidecahedra. Whereas in the benzoate there are four salt molecules per unit cell, in the fluoride there are five. This difference in the number of guests accommodated in essentially the same host structure is possible because the four tetrakaidecahedra occupied by the benzoate groups are available for the four alkyl groups of the additional cation. In the fluoride hydrate, four of the cations have the central N^+ atom at the four-fold positions (j) and that of the fifth is disordered over the two-fold position (f). Thus the structure has lower symmetry than the benzoate hydrate, which is $P4_2/mnm$ by reason of the disorder of the four cations over eight-fold positions. Author

N64-11200* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

VARIATIONS OF THE PROTON ENERGY SPECTRUM WITH POSITION IN THE INNER VAN ALLEN BELT

J. E. Naugle and D. A. Kniffen Repr. from J. Geophys. Res., v. 68, no. 13, 1 Jul. 1963 p 4065–4078 refs
(NASA RP-11)

A cylindrical stack of nuclear emulsions was flown in the payload section of a research rocket into the northern edge of the inner part of the Van Allen radiation region. The emulsion stack was shielded inside a tungsten cassette and was then exposed to the ambient radiation by rotation behind a window in the wall of the cassette covered with a 0.04-g/cm^2 aluminum shield. In this way, it was possible to make a detailed study of the energy spectrum of the trapped particles at various positions in space. The rocket trajectory covered L values ranging from about 1.45 to $1.85R_E$. Five points along the trajectory were chosen for analysis, and the differential and integral proton energy spectrums were obtained from each point. Above 30 Mev, in all cases, and below 30 Mev at the lower L values, the proton energy spectrums were in agreement with previous experiments; however, there was a sharp change in the slope of the spectrums with a steeper slope ($j(E) = KE^{-4.5}$) at the higher L ($L > 1.6R_E$) values than had been expected on the basis of previous experiments and the galactic cosmic-ray neutron albedo theory. Author

N64-11227* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ON THE EFFECT OF A WEAK INTERPLANETARY MAGNETIC FIELD ON THE INTERACTION BETWEEN THE SOLAR WIND AND THE GEOMAGNETIC FIELD

John R. Spreiter and William Prichard Jones Repr. from J. Geophys. Res., v. 68, no. 12, 15 Jun. 1963 p 3555–3564 refs

Recent developments have indicated the possibility that the presence of a weak interplanetery magnetic field may lead to the formation of a collision-free shock wave upstream from the boundary of the geomagnetic field, and to a transition region characterized by an irregular magnetic field in the intervening space. Previous calculations of the coordinates of the shock wave are improved upon by application of recent advances in the theory of gasdynamic shock waves developed for reentry aerodynamic studies. It is found that the standoff distance of the shock wave is increased significanly over previous estimates, and that the new results appear to be at least consistent with observations. Theoretical results are also shown, to illustrate the differences to be anticipated in the transition region where the interplanetary field is aligned parallel or antiparallel to the geomagnetic field in the equatorial plane and when the Alfvén Mach number is greater or less than 2. Author

N64-11379* Massachusetts Inst. of Tech., Cambridge
RADIO OBSERVATIONS OF OH IN THE INTERSTELLAR MEDIUM
Alan H. Barrett [1963] 11 p refs Submitted for Publication
(NASA Grant NsG-419)
(NASA CR-52852) OTS: $1.60 ph, $0.80 mf

The 84-foot parabolic antenna of the Millstone Hill Observatory and a spectral-line autocorrelation radiometer were used to detect 18-cm absorption lines of the hydroxl radical in the radio absorption spectrum of Cassiopeia A, thereby providing positive evidence for the existence of OH in the interstellar medium. Lines at both 1667 and 1665 mc/sec have been detected with frequencies and intensity ratios that are in good agreement with the expected values. J.E.T.

N64-11399 European Atomic Energy Community, Brussels (Belgium)
GROWTH OF UO_2 (SINGLE CRYSTALS)
S. Amelinckx, J. Bressers, K. Nevelsteen, E. Smets, and W. Van Lierde (CEN) Centre d'Etude de l'Energie Nucléaire, Mol (Belgium), Oct. 1963 31 p refs
(Contract Euratom 055-61-7 RDB)
(EUR-345.e; EURAEC-693) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 50 Belg. Fr.

A new method for growing uranium dioxide single crystals from vapor is described. A cylinder of pressed and sintered UO_2 powder is pressed between two cooled electrodes and heated by an electric current directly passing through it. UO_2 vaporizes from the inside of the cylinder to the cold endplates of the electrodes, where deposits are formed consisting of a few large single crystals. Crystals from 4 to 12 mm in size, and up to 5 g in weight are easily obtained. Control by Laue diffraction patterns and chemical analysis showed these crystals to be of high perfection and purity. Author

N64-11403 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
THE INVESTIGATION OF THE NUCLEAR COMPONENT OF COSMIC RAYS ON THE THIRD COSMIC ROCKET
L. V. Kurnosova, L. A. Razorenov, and M. I. Fradkin Jul. 1963 7 p refs Transl. into ENGLISH of an article from Artificial Earth Satellites (Moscow), no. 8, 1961 p 87-89
(*Its* Transl. 461)

The nuclear component of primary cosmic rays is investigated by a Cerenkov counter on the third cosmic rocket. The experiment and results are discussed. Author

N64-11413 Royal Aircraft Establishment, Farnborough (Gt. Brit.)
SECOND-ORDER TRANSITIONS IN HIGH POLYMERS (TRANSITIONS DU SECOND ORDRE DANS LES HAUTS POLYMERES)
R. Boyer London, Min. of Aviation, Sep. 1963 45 p refs Transl. into ENGLISH from "Changements de Phases", Paris, Soc. de Chim. Phys., 1952 p 383-406
(RAE-TRANS-1046)

A general review is given of second-order transitions in solid polymers. An empirical definition is proposed and comparison made with second-order transitions in crystalline solids. The influence of chemical composition and molecular geometry on the second-order transition temperature is examined and compared with the influence of these factors on first-order transitions in semicrystalline polymers. The effect of temperature on the phenomena in the neighborhood of the second-order transition temperature is examined, and it is suggested that the molecular origin of the second-order transition in high polymers is more kinetic than thermodynamic. Finally, the second-order transition in polystyrene is examined in detail. detail. Author

29 SPACE SCIENCES

Includes space chemistry; cosmology; lunar and planetary exploration; and theoretical analysis of orbits and trajectories. *For space biology see*: 16 Life Sciences. *For related information see*: 05 Astronomy and Astrophysics; 12 Geophysics; and 22 Navigation and Guidance.

N64-10776 Joint Publications Research Service, Washington, D.C.
ON THE WAY TO THE PLANET MARS. "MARS-1"
Fl. Zaganescu *In its* Transl. from Stiint. si. Tech. (Sci. and Technol.) [Bucharest] v. 14, [no. 9 and no. 11] Sep.–Nov. 1962. (Air Transport and Space Sci.) 4 Apr. 1963 p 11–19 (See N64-10773 02-01) OTS: $0.75

Preparations for the launching of the MARS-1 space probe and the equipment carried on the probe are discussed. The main purpose for launching the approximately one-ton space laboratory was to carry out long-range studies in cosmic space, to establish interplanetary space radiocommunications, to photograph Mars, and to transmit the photographs by radio. P.V.E.

N64-10860 National Aeronautics and Space Administration, Washington, D.C.
EXPERIMENTS FOR THE UNMANNED SCIENTIFIC EXPLORATION OF THE MOON
Newton W. Cunningham Repr. from Lunar and Planetary Programs, p 526–530

The unmanned exploration of the moon is expected to provide answers to a great many questions concerning the history of the earth–moon system and the origin of other bodies in our solar system. The means for obtaining these answers lie in the efficient use of a variety of scientifically instrumented spacecraft capable of probing, measuring, analyzing, and observing the properties of the lunar environment, surface, and subsurface. Some of the experiments being considered for lunar rough- and soft-landing payloads are discussed, as well as the type of information that would be most desirable from a lunar orbiter. A brief résumé of the steps necessary in the development of instrumentation for unmanned geologic investigations is also presented. Author

N64-10894* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
RESULTS OF THE TELSTAR SATELLITE SPACE EXPERIMENTS

P. T. Hutchison and R. A. Swift *In its* Telstar I, Vol. 2, Jun. 1963 p 1475–1504 refs (See N64-10882 02-01)

This paper describes how the Telstar satellite has performed in space. Included is information on changes in the temperature, spin rate, spin-axis precession, orbital parameters and power levels of the satellite signals, and comments on the behavior of the electrical circuits in the space environment. Author

N64-10902* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
MARINER B CAPSULE PROPULSION STUDY
R. Sehgal, R. Breshears, J. Acord, R. Thompson, E. Pounder et al 1 June 1962 36 p refs
(NASA Contract NAS 7-100)
(NASA CR-52535; JPL-TM-33-86) OTS: $3.60 ph, $1.28 mf

The advantages of propelling the Mariner B capsule from the spacecraft on a flyby trajectory, as opposed to merely dropping it from the spacecraft on an impact trajectory and then diverting the spacecraft bus, are as follows: (1) enhancement of overall mission reliability by minimizing the number of spacecraft propulsion maneuvers; (2) elimination of spacecraft bus sterilization by substantially reducing the probability of impact on the planet; (3) overall weight saving by trading the miss-maneuver on the heavy bus for an impact maneuver with the lighter capsule, and also eliminating the need for a very accurate approach trajectory for the spacecraft; (4) elimination of the spacecraft-capsule eclipse by Mars after capsule entry. Author

N64-10903* Cutler-Hammer, Deer Park, N.Y.
STUDY OF TOPSIDE SOUNDER FOR MARS AND VENUS IONOSPHERES FROM MARINER SPACECRAFT Final Report
T. Flattau and R. Donegan Oct. 1963 118 p refs
(NASA Contract NASw-513)
(NASA CR-52731; Rept. 1844-1) OTS: $9.60 ph, $3.74 mf

This report analyzes the problems and solutions in sounding the topside of the ionospheres of Mars and Venus from a passing spacecraft. A recommended system configuration is described that uses a set of optimum techniques for performing the soundings requiring peak RF powers that are compatible with solid-state transmitters. Transmission of an interrupted CW (50-percent duty cycle) RF pulse train that is small-angle phase modulated by a 150-cps tone is chosen as the optimum modulation. The distance to the reflecting layer of the ionosphere can then be determined by measuring the phase delay of the detected tone in the received signal. A partial breadboard of the recommended system was constructed during the study to verify the suitability of the various techniques and their compatibility. The design specifications and details of the system components are discussed. Author

N64-10907* Aeronutronic, Newport Beach, Calif.
THE EMPIRE DUAL PLANET FLYBY MISSION
Franklin P. Dixon [1963] 46 p refs
(NASA Contract NAS8-5025)
(NASA CR-52677) OTS: $4.60 ph, $1.58 mf

Mission analyses and spacecraft syntheses are reported for various methods of accomplishing a manned mission with close approach to both Venus and Mars and return to the Earth in the 1970-72 period. Major systems requirements are defined and a development plan and funding schedule are presented for accomplishing the dual planet flyby, using a nuclear engine for interplanetary injection from Earth orbit, taking up to 631 days, and providing for Earth return with a lifting reentry vehicle. Accelerated developments required to support such a mission are specified. Author

N64-11169 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
PARKING ORBIT FOR MOON TRIPS
Nikolay Varvarov 9 Aug. 1963 4 p Transl. into ENGLISH from the German Newspaper, Berliner Zeitung, Sunday Suppl., 19 May 1963 p 4
(FTD-TT-63-699/1; AD-420662)

The advantages of starting spaceships from a parking orbit for landing on the moon (and returning to the earth from the moon) are discussed. R.T.K.

N64-11192* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF FLANK LOSSES IN THE THEORY OF SPACE-PROBE ENTRY UNDER CONDITIONS OF HIGH MASS LOSS
Frederick C. Grant Washington, NASA, Dec. 1963 39 p refs
(NASA TN D-2050) OTS: $1.00

Limiting entry velocity is the minimum value for which the heat-protection material is completely consumed. It was found previously, for zero flank losses, that steepening of the flanks yielded higher limiting velocities. The fractional parts of the previously indicated gains in limiting velocity that are attainable under finite flank loss are calculated. It is found that there is always a gain with steeper flanks as long as the sweep of the flanks is enough to keep the coefficient of heat transfer to the flanks below that to the face of the probe. Effects of flank losses on peak deceleration values, deceleration pulse shapes, and altitude of the high-mass-loss regions are calculated. Cone half-angles up to 90° and flank-mass-loss rates as high as face-mass-loss rates are considered. Mass losses during entry of one-half to seven-eights of the initial mass are considered. Author

N64-11198* National Aeronautics and Space Administration, Washington, D.C.
SATELLITE TO STUDY "SPACE WEATHER" News Release No. 62-206
30 Sep. 1962 18 p
Available from NASA. Office of Scientific and Technical Information, Wash., D.C.

A description is presented of the S-3a Explorer satellite, and the Delta launch vehicle. The objective of the satellite is to describe completely the trapped corpuscular radiation, solar particle, cosmic radiation, and the solar winds, and to correlate the particle phenomena with magnetic field observation. R.T.K.

N64-11203 General Electric Co., Philadelphia, Pa. Space Sciences Lab.
THE POTENTIAL OF VARIOUS APPROACHES FOR MANNED LUNAR LANDING MISSIONS AS MEASURED BY LAUNCH WEIGHT REQUIREMENTS
Norris F. Dow Nov. 1963 41 p
(R63SD52)

A review is made of various techniques (direct, earth orbit rendezvous, lunar orbit rendezvous, libration point rendezvous) for accomplishing the manned, lunar landing mission. With the use of high-energy on-board propellants, a minimal manned lunar landing mission is shown to be possible with a booster capable of placing 32,000 pounds in a 300 nmi altitude earth orbit. The relative efficiency of the various approaches is shown to depend upon the ratio of weights landed on the moon (as with a lunar excursion module), to weights returned to earth (as with the main vehicle). If the lunar ferry

weight is small, the libration point rendezvous approach is most efficient; if a heavy lunar ferry is required, the use of earth orbit rendezvous and no ferry may be most efficient.
Author

N64-11221 Joint Publications Research Service, Washington, D.C.
COSMIC FLIGHTS AND SCIENCE
N. S. Kalitsin 17 Jul. 1963 5 p Transl. into ENGLISH of an article from Rabotnichesko Delo (Sofia), 25 Jun. 1963 p 3
(JPRS-20212; OTS-63-31309) OTS: $0.50

A brief description is presented of the possibilities and applications in science—particularly in astronomy and medicine—which result from the development of cosmic flights. P.V.E.

N64-11234* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENTS FROM A SMALL PROBE WHICH ENTERS THE ATMOSPHERE OF MARS
R. A. Hanel, L. E. Richtmyer, R. A. Stampfl, and W. G. Stroud Washington, NASA Dec. 1963 23 p refs
(NASA TN D-1899) OTS: $0.75

This paper addresses itself to the design of a Mars capsule capable of a safe entry and landing on Mars. Quite simple sensors of pressure, temperature, density, molecular weight, and gross composition of the atmosphere can yield significant physical and ecological data. The safe landing will permit the execution of significant biological experiments for the detection of life. Data transmitted at a rate of 1 bit/sec during the capsule descent and following the landing are best handled by a direct planet-to-Earth communication link. The significance of the experiments and the techniques required are discussed.
Author

N64-11262* United Aircraft Corp., Farmington, Conn.
RESEARCH STUDY ON THE ACCELERATION HODOGRAPH AND ITS APPLICATION TO SPACE TRAJECTORY ANALYSIS Final Report
1 Jul. 1963 90 p refs
(NASA Contract NASw-565)
(NASA CR-52873; SCR-151) OTS: $8.10 ph, $2.90 mf

It is shown that the acceleration hodograph of an orbit (i.e., a ballistic trajectory) is a form of the limaçon. The acceleration limaçon and the hodograph equations of motion enable a direct graphical representation of the thrust program, as well as space, velocity, and acceleration coordinates of the trajectory. The hodograph equations describe the space vehicle motion with thrust, by a continuum of instantaneous orbital hodographs. Consequently, upon thrust termination for any reason and at any instant of time, the hodograph equations provide the subsequent ballistic trajectory directly. Machine solution of the hodograph equations requires only one integration of first-order, nonlinear differential equations, while the classical equations require two integrations of second-order, nonlinear differential equations. The space trajectory obtainable with one class of thrust program has been analyzed by use of the hodograph equations of motion and associated relations. This thrust program, which is being studied for potential lunar landing applications, resulted in acceleration hodograph equations of trigonometric form.
Author

N64-11329* Analytical Mechanics Associates, Inc., Uniondale, N.Y.
MINIMUM VARIANCE PRECISION TRACKING AND ORBIT PREDICTION PROGRAM Final Report, 26 Jun. 1962-15 May 1963
Samuel Pines et al 1963 51 p refs
(NASA Contract NAS5-2535)
(NASA CR-52872) OTS: $5.60 ph, $1.73 mf

The minimum variance precision tracking and orbit prediction program is reviewed. In this review it is reported that: (1) The Encke perturbation method for precision orbit prediction, for the effect of round-off and machine time solution rates, is preferred over the variation of parameters because of the simplicity of the equations and the great reduction in computing time. It is possible to generate a precision program, using the Encke method, which will produce a solution of the equations of motion as precisely as required in shorter computing time than by any other available method. (2) The Schmidt–Kalman minimum variance technique permits a complete optimum estimate of the orbit variables and the observation errors from each single observation. (3) A convenient set of orbit parameters have been derived which avoid the difficulties for circular and low inclination orbits as well as restrict the energy parameters to a single element. (4) A set of analytical derivatives, based on the two-body problem approximation of the osculating orbit given in terms of the set of parameters referred to in (3), have been derived. I.v.L.

N64-11393* Cornell U., Ithaca, N.Y. Center for Radiophysics and Space Research
PHOTOMETRIC STUDIES OF COMPLEX SURFACES, WITH APPLICATIONS TO THE MOON
Bruce Hapke and Hugh Van Horn Repr. from J. Geophys. Res. v. 68, no. 15, 1 Aug. 1963 p 4545–4570 refs
(NASA Grant NsG-119-61)

The reflection laws of a wide variety of surfaces have been measured. The factors that govern the optical scattering characteristics of complex surfaces are discussed, and the properties of surfaces that scatter light like the moon are specified. Surfaces of solid rocks, volcanic slags, or coarsely ground rock powders do not have the intricate structure necessary for backscattering light strongly but finely pulverized dielectric particles can build extremely complex surfaces that can reproduce the lunar scattering law. It is concluded that the surface of the moon is covered with a layer of fine rock dust composed of particles of the order of 10-micron average diameter, and that 90 percent of the volume of the surface layer is voids.
Author

N64-11411 Martin Co., Baltimore, Md. Electronic Systems and Products Div.
PREDICTION ACCURACY PROGRAM FORMULATION AND UTILIZATION
W. E. Wagner, D. W. Marquet, and T. L. Funkhouser Sep. 1963 103 p
(ER-13143)

The Prediction Accuracy Program (PAP) is a digital computer program capable of determining the certainty to which a satellite orbit is determined from ground measurements. The program considers the tracking measurements consisting of range, range rate, azimuth, elevation and direction cosines. The program determines the covariance matrix of the orbital elements a, e, i, ω, t_p and Ω from the known mean square deviations of the measurement data based on a weighted least-squares analysis. In addition, the confidence ellipsoids of position and velocity are determined. The Keplerian equations are used to determine the sensitivities of the measurements with respect to the orbital parameters.
Author

N64-11425 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
THE DETERMINATION OF THE ORBIT FROM TWO POSITIONS
P. E. El'yasberg [1963] 34 p refs Transl. into ENGLISH from Iskusstvennye Sputniki Zemli (Moscow), no. 13, 1962 p 3-22 (*Its* Transl. 433)

The explicit guidance problem of Keplerian mechanics is discussed and analyzed in detail as to the types of motion between two positions, and the existence and uniqueness of the motion. Author

30 SPACE VEHICLES

Includes launch vehicle-spacecraft combinations; missile systems; operating problems; safety devices; and stability and control. *For boosters and launch vehicles see*: 31 Space Vehicles (Launch Vehicles). *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

N64-10874* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPACECRAFT ANTENNAS
J. T. Bangert, R. S. Engelbrecht, E. T. Harkless, R. V. Sperry, and E. J. Walsh *In its* Telstar I, Vol. 1 Jun. 1963 refs (See N64-10868 02-01)

The spacecraft employs two microwave antennas for communications and a single VHF antenna for telemetry, beacon, and command functions. One microwave antenna centered at 6 Gc is used to receive broadband signals from a ground transmitter while the other microwave antenna centered at 4 Gc is used to transmit signals to a ground receiver. Each microwave antenna is composed of a large number of circularly polarized radiating elements equally spaced around the equator of the spacecraft and connected to the electronic receiver and transmitter by a complex precision feed system. The VHF antenna is a small multielement helix mounted at the pole of the spacecraft and radiates a linearly polarized signal. All antennas provide nearly isotropic antenna patterns with the axis of symmetry corresponding to the spin axis of the spacecraft. Author

N64-10877* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPACECRAFT STRUCTURE AND THERMAL DESIGN CONSIDERATIONS
P. Hrycak, D. E. Koontz, C. Maggs, J. W. Stafford, B. A. Unger, and A. M. Wittenberg *In its* Telstar I, Vol. 1 Jun. 1963 p 975–1004 refs (See N64-10868 02-01)

This paper covers the general structural and thermal design considerations of the Telstar satellite. The basic objectives were to maintain the electronic components in a near-room-temperature environment, and to protect the electronics package from high-frequency vibration excitation. These objectives were realized by dividing the satellite into two lumped masses, the shell and the centrally located electronics package, and by utilizing nylon lacing for support of the electronics package. The package was provided with an active temperature control, regulating radiative heat flow between the skin and the package. Results of on-the-ground experimental evaluation and of telemetry data are given. Author

N64-10878* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPACECRAFT TEST AND EVALUATION PROGRAM
T. B. Delchamps, G. C. Jonasson, and R. A. Swift *In its* Telstar I, Vol. 1 Jun. 1963 p 1007–1025 refs (See N64-10868 02-01)

Considerations guiding the planning and execution of environmental tests in the development, design qualification, and flight acceptance phases of the Telstar satellite program are discussed. Specific test procedures are covered, and highlights of test results involving mechanical, thermal, and magnetic properties of the spacecraft are reviewed. Author

N64-10910* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
INTEGRATED MISSION SIMULATION FOR LONG TERM SPACE FLIGHT
Milton A. Grodsky and John P. Bryant (Martin Co., Baltimore) *In* Am. Inst. of Aeron. and Astronautics AIAA Simulation for Aerospace Flight Conf., a vol. of Tech. Papers Presented Aug. 26-28, 1963, Columbus, Ohio [1963] p 147–153 refs (See N64-10908 02-01)

A determination was made of the degree of fidelity with which airplane dynamic and static response characteristics must be simulated in a ground-based simulator. The techniques of inference that were used, and the determinations of pilot sensitivity to the airplane characteristics, are presented R.T.K.

N64-11102* Space Technology Labs., Inc., Redondo Beach, Calif.
ATLAS/CENTAUR PROGRESS REPORT, 30 SEPTEMBER THROUGH 11 OCTOBER 1963
T. W. Layton [1963] 10 p
(NASA Contract NAS3-3231)
(NASA CR-52697; Rept. 8414-6108-RU-000) OTS: $1.10 ph, $0.80 mf

Progress in the Atlas–Centaur program is reported in the following areas: vehicle dynamics, guidance, and controls; launch wind constraints study; mission analysis; and propulsion performance and supporting investigations. M.P.G.

N64-11180 Aerospace Corp., El Segundo, Calif.
GRAVITY GRADIENT EXCITATION OF A ROTATING CABLE-COUNTERWEIGHT SPACE STATION IN ORBIT
V. Chobotov 1 Apr. 1963 (Rev. 1) 68 p refs
(Contract AFO4(695)-169
(TDR-169 (3530-20)TN-1; SSD-TDR-63-17)

The gravity gradient excitation of a whirling cable-counterweight space station in orbit is investigated. Lagrange's equations of motion for transverse oscillations of the system are derived and shown to be of the Mathieu tupe. A few representative cases are solved on an IBM 7090 computer for the cable natural frequencies, which are required in the stability criteria derived. The stability criteria for the axial vibrations are shown to be of the same kind as those for the transverse vibrations of the cable. Damping is included in the analyses and found to be effective and essential for prevention of parametric excitation instability of the system. Author

N64-11428 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
THE OPTIMIZATION OF FLIGHT REGIMES AND PARAMETERS OF MULTI-STAGE ROCKETS

Yu. V. Kozhevnikov [1963] 18 p refs Transl. into ENGLISH from Izv. Vysshikh Ucheb. Zabedenii Aviats-Tekh. (USSR), no.3, 1963 p 11–20
(*Its* Transl. 481)

This paper presents the sets of necessary conditions for solving the following variational problems connected with multistage rockets: (1) maximizing range, (2) maximizing the horizontal velocity component, and (3) maximizing the vertical velocity component. Author

31 SPACE VEHICLES (LAUNCH VEHICLES)

Includes boosters; clustered rockets; and multistage rockets. *For propulsion engines see*: 27 Propulsion. *For manned space capsules, satellites, and sounding rockets and space probes see*: 32 Space Vehicles (Spacecraft). *For launch vehicle-spacecraft combinations see*: 30 Space Vehicles. *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

N64-10893* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LAUNCHING OF THE TELSTAR SATELLITE
H. N. Upthegrove, J. B. D'Albora, Jr., A. R. Kolding, and B. A. Mc Leod. *In its* Telstar I, Vol. 2, Jun. 1963 p 1449-1473 refs (See N64-10882 02-01)

The launching of the Telstar satellite from Cape Canaveral is described, with emphasis on the prelaunch testing and facilities. Author

32 SPACE VEHICLES (SPACECRAFT)

Includes manned space capsules; satellites; and sounding rockets and space probes. *For boosters and launch vehicles see*: 31 Space Vehicles (Launch Vehicles). *For launch vehicle-spacecraft combinations see*: 30 Space Vehicles. *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

N64-10774 Joint Publications Research Service, Washington, D.C.
LIVING IN SPACE
T. Ion *In its* Transl. from Stiint si Tech. (Sci. and Technol.) [Bucharest] v. 14, [no.9 and no. 11] Sep.–Nov. 1962. (Air Transport and Space Sci.) 4 Apr. 1963 p 1–3 (See N64-10773 02-01) OTS: $0.75

Problems of supplying oxygen, water, and the other necessary elements for living a normal life in space are discussed. Methods suggested to provide for the oxygen necessary for breathing, including chemical, physiological, and biological regeneration, are reviewed. Schemes which have been proposed for the supplying of water and for temperature control are also discussed. P.V.E.

N64-10840 Joint Publications Research Service, Washington, D.C.
AN ESTIMATION OF THE ACCURACY OF ARTIFICIAL EARTH SATELLITE COORDINATES OBTAINED WITH A MOVING-FILM CAMERA
M. V. Bratiychuk and I. V. Shavalagin (Uzhgorod Earth Satellite Observation Station) *In its* Accuracy Problems in the Observation of Artificial Earth Satellites 11 Jul. 1963 p 3–8 refs Transl. into ENGLISH from Byul. St. Optich. Nablyudeniya Iskusstv. Sputnikov Zemli (Moscow), no. 25, 1962 p 13–15

The results of observations of certain orbital elements of two of the 1960 artificial earth satellites are presented in tabular form. The experimental object was to determine the accuracy of KPP (camera with moving film) photography by comparison with a standard method. A discussion of error analysis is included and it was determined that an accuracy of 10 sec to 15 sec is possible with the KPP method. A disadvantage of the KPP method, however, is that negative processing requires a far greater amount of time than does the standard method. J.E.T.

N64-10869* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE TELSTAR EXPERIMENT
A. C. Dickieson *In its* Telstar I, Vol. 1 Jun. 1963 p 739–746 refs (See N64-10868 02-01)

The reasons for the inception of the Telstar experiment, and some general results of this project are examined. A brief history of the development and capabilities of the worldwide communications network prior to Telstar is given. It was clear that the frequency space available in the HF range was not sufficient to support the volume of communications being developed, and because of the physical limitations inherent in the very nature of the radio transmission medium, the reliability and quality of the resultant telephone circuits would leave something to be desired. Faster and more reliable communications systems would have to be found; satellite communication could be the best possible answer. Telstar was used in speech and television tests first, and then in more than 250 technical tests covering every aspect of transmission, and in over 400 demonstrations including multichannel telephony, telegraphy, data, telephoto, and other facsimile transmissions. Television was demonstrated 47 times, including 5 times in color. Telstar showed that subsequent satellites could be engineered with confidence, and from the clear understanding of ground-station problems as a result of the Telstar experience, second-generation ground stations could be considerably simpler than the first experimental station at Andover. J. E.T.

N64-10870* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RESEARCH BACKGROUND OF THE TELSTAR EXPERIMENT
A. B. Crawford, C. C. Cutler, R. Kompfner, and L. C. Tillotson *In its* Telstar I, Vol. 1 Jun. 1963 p 747–764 refs (See N64-10868 02-01)

For several years before the launch of the Telstar satellite, research effort was directed toward an experiment with an active satellite capable of relaying a broadband communication channel. The intention was to utilize and test a number of novel techniques which had become available, to explore those areas in which the current technology was lacking, and to demonstrate the feasibility of this means of communication. This paper describes some of this work, the background of facts and beliefs on the basis of which a number of important choices were made, and the general state of the radio art upon which the Telstar program was built. Author

N64-10871* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE TELSTAR SATELLITE SYSTEM

D. F. Hoth, E. F. O'Neill, and I. Welber *In its* Telstar I, Vol. 1 Jun. 1963 p 765-799 refs (See N64-10868 02-01)

This paper describes the Telstar system and discusses the overall system design. System considerations, the orbit selection, and frequency allocation considerations are covered. The transmission performance is given with some discussion of system parameters. Author

N64-10872* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A GENERAL DESCRIPTION OF THE TELSTAR SPACECRAFT

R. H. Shennum and P. T. Haury *In its* Telstar I, Vol. 1 Jun. 1963 p 801-830 refs (See N64-10868 02-01)

The Telstar spacecraft design is discussed with emphasis on the electronics system. The description includes early planning, starting with frequency allocation considerations, and carries the program through electrical and mechanical design, construction, and evaluation of the electronics system. The content is aimed at a broad introduction, depending on companion papers for many details of the spacecraft design. Author

N64-10873* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE SPACECRAFT COMMUNICATIONS REPEATER

C. G. Davis, P. T. Hutchison, F. J. Witt, and H. I. Maunsell *In its* Telstar I, Vol. 1 Jun. 1963 p 831-867 refs (See N64-10868 02-01)

This paper describes the electrical characteristics of the waveguide components, the solid-state circuits, and the traveling-wave tube used in the microwave communications repeater. The reflex-circuit method of obtaining local oscillator signals for the modulators and certain circuit stability problems are discussed. Author

N64-11080* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

COMPONENTS FOR THE TELSTAR PROJECT

W. C. Hittinger *In its* Telstar I, Vol. 3 Jun. 1963 p 1659-1664 refs (See N64-11079 02-01)

The Telstar project required a variety of components and structures of high reliability. The program for obtaining these components was essentially that originated for submarine cable devices in which designs of proven integrity were manufactured under controlled conditions, screened and aged to remove defectives, and then life tested and certified using techniques for selecting the most stable components. This program summary illustrates, in principle, the techniques described in detail in the body of this report. Author

N64-11107* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SATELLITE SITUATION REPORT, VOLUME 3, NO. 22

15 Nov. 1963 10 p
(NASA TM X-51205; NASA-X-533-63-1) OTS: $1.10 ph, $0.80 mf

Information presented for objects in orbit as of Nov. 15, 1963 includes: code name, source (U.S. or U.S.S.R.), launch date, nodal period, inclination, apogee, perigee, and transmitting frequency. Information presented for objects which have decayed since Nov. 8, 1963 includes: code name, source, launch date, and decay date. P.V.E.

N64-11110* National Aeronautics and Space Administration, Washington, D.C.

USE OF ARTIFICIAL EARTH SATELLITES FOR TERRESTRIAL NAVIGATION

Alton B. Moody 8 Oct. 1962 16 p Presented at the Space Seminar Michigan State U., 8 Oct. 1962
(NASA-TM-X-51206) OTS: $1.60 ph, $0.80 mf

Desirable characteristics of a navigation satellite system are listed. The following techniques, with their advantages and disadvantages, are considered: elevation angle, horizontal angle, range, range rate, and orbits. The only navigation satellite system under active development, TRANSIT, utilizes the Doppler range rate technique. R.T.K.

N64-11122 Joint Publications Research Service, Washington, D.C.

MEETING HONORING THE FIRST ARTIFICIAL EARTH SATELLITE

G. P. Mikhaylovskiy 30 Apr. 1963 10 p refs Transl. into ENGLISH of an article from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 1, Jan.-Feb. 1963 p 152-156
(JPRS-18994; OTS-63-21725) OTS: $0.50

Papers were presented in the following areas: (1) sustaining cosmic flights, (2) effect of spaceflight factors on living organisms, and (3) radiobiology. R.T.K.

N64-11236* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

FREE-FLIGHT INVESTIGATION OF THE DEPLOYMENT OF A PARAWING RECOVERY DEVICE FOR A RADIO-CONTROLLED 1/5-SCALE DYNAMIC MODEL SPACECRAFT

Charles E. Libbey Washington, NASA Dec. 1963 23 p refs
(NASA TN D-2044) OTS: $0.75

A free-flight investigation of a radio-controlled model of a manned reentry spacecraft with a telescoping rigid parawing as a recovery system was made to evaluate the deployment process, and the stability and control characteristics of the configuration. Flight tests showed that the parawing could be deployed from a packaged condition, but that the deployment process must be a sequence of carefully controlled and timed events, and that some portions of the deployment should not occur at too fast a rate. The most significant single factor learned about the deployment process was that the parawing had to be slowly rotated to a lifting condition. Transition which is too fast from zero lift to maximum lift would result in a tumbling motion. After the parawing was deployed, the configuration was stable and controllable. Author

N64-11254* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SCIENTIFIC RESULTS OF THE FIRST ORBITING SOLAR OBSERVATORY

John C. Lindsay Repr. from Trans. Amer. Geophys. Union, v. 44, no. 3, Sep. 1963 p 722-725
(NASA RP-85)

This paper summarizes reports presented on the scientific results of the first orbiting solar observatory (OSO 1). R.T.K.

N64-11256* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SCOUT-VEHICLE AERODYNAMIC-NOISE MEASUREMENTS

David A. Hilton Repr. from Sound v. 2, no. 5, Sep.-Oct. 1963 p 28-31 refs
(NASA RP-87)

Results are presented of a surface-pressure-measurement experiment accomplished on a Scout launch vehicle. Systematic data were obtained for Reynolds numbers (based on distance rearward from the nose of the vehicle to the transducer location) up to about 400 X 10^6, and for Mach numbers to near 4. These data have direct application to the supersonic transport and to launch vehicles. C.L.W.

33 STRESSES AND LOADS

Includes fatigue; vibration; flutter; and structural tests. *For thermal stress see*: 13 Heat Transfer and Thermodynamics. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 34 Structural Design.

N64-10823 Deutsche Versuchsanstalt für Luftfahrt, Mülheim an der Ruhr (W. Germany) Inst. für Festigkeit
CHARACTERISTIC VIBRATIONS OF STIFFENED CIRCULAR CYLINDRICAL SHELLS [EIGENSCHWINGUNGEN VERSTEIFTER KREISZLINDERSCHALEN]
Walter Schnell and Franz-Josef Heinrichsbauer 1963 23 p refs In GERMAN

An investigation of the free vibrations of a longitudinally stiffened circular cylinder was conducted according to the linear theory. The basic equations for orthotropic circular cylinders were given, and methods for solving the equations (continuous: "indistinct orthotropy"; discontinuous: matrix method) are illustrated. The transfer matrix method includes the influence of discrete stiffening on the vibrational behavior. This method permits the derivation of closed-form frequency equations and the determination of the characteristic form in a simple manner. The results of the theoretical investigation are compared with experimental results. Trans. by I.v.L.

N64-10974 Deutsche Versuchsanstalt für Luft- und Raumfahrt, Mulheim an der Ruhr (W. Germany) Inst. für Festigheit
A THIN RECTANGULAR CANTILEVER PLATE OF LARGE DEFLECTION REINFORCED ABOUT THE EDGES WITH UNIFORMLY DISTRIBUTED LOAD [DIE EINGESPANNTE, AN DEN RANDERN VERSTEIFTE, DUNNE RECHTECKPLATTE GROSSER DURCHBIEGUNG MIT GLEICHMASSIG VERTEILTER BELASTUNG]
Olag Volkersen Jul. 1963 94 p
(DVL-262)

An approximation method is described which permits, with sufficient accuracy, the determination of the bending moments along the symmetric line of a thin plate with a large deflection when only the deflection of the plate is known. This method is also applicable to plates with variable bending strengths. The numerical evaluation is carried out for a square plate which can be reinforced along the clamped edges. Several preliminary experiments were conducted, as an extension of the theoretical investigation, and the results of these experiments were in good agreement with the calculated values. Large deviations between the calculated and experimental values in the case of 1-mm-thick sheet metal was due to the imperfection of the testing unit, and to the dents in the extremely thin sheet. The course of maximum elongation was made visible, in a few plates, by means of a stress coat. Transl. by I.v.L.

N64-11151 Air Force Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
STRESS DISTRIBUTION IN COMPRESSOR BLADES DURING VIBRATION [RASPREDELENIYE NAPRYAZHENIY V KOMPRESSORNYKH LOPATKAKH PRI KOLEBANIYAKH]
I. I. Meyerovich Transl. Into ENGLISH of book Moscow State Sci. Technol. Publ. House, 1961 4 Dec. 1962 112 p refs
(FTD-TT-62-740/1+2; AD-294535)

This study sets forth a method for the computation of natural vibrations in compressor blades. On the basis of the theory of plates, a convenient solution has been obtained for calculating the forms and frequencies of the natural vibrations and stresses in the vicinity of resonance. Diagrams, tables, and approximate formulas that simplify the calculations considerably are presented. Also given are an illustrative numerical calculation for a blade of arbitrary type, and a comparison of the results with experiment. Author

N64-11178 Bolt, Beranek, and Newman Inc., Cambridge, Mass.
RANDOM VIBRATION STUDIES OF COUPLED STRUCTURES IN ELECTRONIC EQUIPMENTS [Final Report, May 15-Nov. 15, 1962]
Richard H. Lyon, Gideon Maidanik, Ewald Eichler, and James J. Coles Wright-Patterson AFB, Ohio, Directorate of Eng. Test, Apr. 1963 81 p refs
(Contract AF 33(657)-9118)
(ASD-TDR-63-205; AD-405919)

The research has centered on two main categories—the replacement of acoustic excitation by direct mechanical excitation of structures, and the response of substructures which are tied to a randomly vibrating primary structure. Studies are included on the power transferred to a plate by a shaker, the variation in vibratory response at various positions and frequency bands, and the energy sharing between randomly excited structures which have mechanical connections. Author

N64-11335* Alabama U., University
GENERAL INSTABILITY OF AN ORTHOTROPIC CIRCULAR CYLINDRICAL SHELL SUBJECTED TO A PRESSURE COMBINED WITH AN AXIAL LOAD CONSIDERING BOTH CLAMPED AND SIMPLY SUPPORTED EDGE CONDITIONS Summary Report, Section 1, May 28, 1962-Oct. 15, 1962
Carl C. Steyer and Thomas A. Carlton, Jr. Nov. 1962 24 p refs
(NASA Contract NAS8-5012)
(NASA CR-52881) OTS: $2.60 ph, $0.92 mf

A set of instability equilibrium equations is derived for an orthotropic, circular, cylindrical shell by applying variational methods to the expression for the total energy of the shell. From these equilibrium equations, an eighth-order differential equation of the Donnell type is obtained for a cylinder of uniform thickness, subjected to a pressure and a compressive axial force. This differential equation is solved for the case of simply-supported edge conditions, and a quadratic algebraic expression is developed that yields the buckling criteria. This algebraic expression can be minimized quite readily for certain parameters by the use of a digital computer used for the purpose of establishing design criteria. The Donnell-type differential equation is also solved for the case of clamped edge conditions, and a four-by-four determinant that yields the buckling criteria is developed. J.E.T.

N64-11336* Alabama U., University
STRESSES IN A SEGMENT OF A CONICAL SHELL SUBJECTED TO LATERAL NORMAL LOAD Summary Report, Section 11, May 28, 1962-Oct. 15, 1962
Chin Hao Chang Nov. 1962 35 p refs
(NASA Contract NAS8-5012)
(NASA CR-52882) OTS: $3.60 ph, $1.25 mf

Following a linear theory of conical shells, a solution for a segment of an isotropic truncated conical shell, with linearly varying thickness subjected to an arbitrary lateral normal load, is obtained. The segment is clamped at the smaller circular end, and free at the other end. The straight edges lying in two meridians are assumed to be free from bending and normal force. Author

N64-11337* Alabama U., University
GENERAL INSTABILITY OF AN ORTHOTROPIC CIRCULAR CONICAL SHELL SUBJECTED TO HYDROSTATIC PRESSURE AND A COMPRESSIVE AXIAL FORCE Summary Report, Section III, May 28, 1962-Oct. 15, 1962
Carl C. Steyer and Shih-Cheng Zien Nov. 1962 20 p refs
(NASA Contract NAS8-5012)
(NASA CR-52883) OTS: $1.60 ph, $0.80 mf

A set of instability equilibrium equations for an orthotropic circular conical shell are derived by applying variational methods to the expression for the total energy of the shell. From these equilibrium equations an eighth-order differential equation of the Donnell type is obtained for a circular conical shell segment of uniform thickness subjected to an external hydrostatic pressure and a compressive axial force. The solution of the problem of the determination of the instability criteria for a stiffened cone frustum subjected to a combination of loads was considered and was found to pose great mathematical difficulties. R.T.K.

34 STRUCTURAL DESIGN

Includes structural elements; and weight analysis. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 33 Stresses and Loads.

N64-11189 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
STRESSED STATE OF CYLINDRICAL SHELLS, REINFORCED WITH RIBS
D. V. Vaynberg, V. O. Zarutskiy and B. Z. Itenberg 30 Apr. 1963 16 p Transl. into ENGLISH from Prik. Mekh. (Ukr.), v. 6, no. 4, 1960 p 375-384
(FTD-TT-62-1623/1+2; AD-409273)

Two methods for investigating the stressed state of a circular cylinder, reinforced with a regular screen of annular and rectilinear ribs are discussed. These methods are (1) solving differential equations and (2) solving integrodifferential equations. The latter method is preferred in that it facilitates the determination of the displacements and of the unknown forces at the shell-rib joints. Also, the utilization of a trigonometric series eliminates the necessity of determining arbitrary integration constants and improves the variation of rib characteristics. I.v.L.

N64-11247 Lockheed Missiles and Space Co., Sunnyvale, Calif.
EFFECTS OF BOUNDARY CONDITIONS ON THE STABILITY OF CYLINDERS SUBJECT TO LATERAL AND AXIAL PRESSURES Technical Report
L. H. Sobel Sept. 1963 22 p refs
(LMSC-6-90-63-91)

This report presents an analysis of critical combinations of uniform external lateral pressure and central axial compressive force for circular cylindrical shells with arbitrarily prescribed boundary conditions. Numerical results are presented for the special case of hydrostatic pressure loading for eight different sets of boundary conditions. The numerical results show that prevention of edge rotation of a generator has little effect on the critical pressure unless the cylinder is quite short. On the other hand, it is shown that the presence of axial restraint at the boundaries significantly increases critical pressures for intermediate-length cylinders. Author

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North Carolina: Winston-Salem
Ohio: Akron
Cleveland Public Library
Oklahoma: Oklahoma City
Oregon: Portland
Pennsylvania: Philadelphia
South Carolina: Rock Hill
South Dakota: Sioux Falls
Tennessee: Memphis
Texas: Dallas, Houston
Washington: Seattle
Wisconsin: Milwaukee